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ABSTRACT

Outlines of five sessions of the Metric Leader Training Project for Maine are included in this publication. Topics are: (1) Introduction - Length - Temperature; (2) Volume/Capacity - Mass/Weight; (3) Metric Advocacy - Length - Area - Temperature; (4) Metric Education Resources; and (5) Metric Education Planning - Metric Olympics - Final Evaluation. The report also contains the workshop schedule and samples of forms included in the Bibliographic Data Questionnaire, Metric Questionnaire, a quiz, a homework assignment sheet, and evaluation forms. A series of suggested activities are outlined, relevant newspaper articles are included, and a resource list is given. (MK)

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WORKSHOP OUTLINE AND TRAINING MATERIALS FOR ADULT LEARNERS DEVELOPED DURING THE METRIC LEADER TRAINING PROJECT FOR MAINE

by

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SE 030 763

Workshop Outline

Maine Metric Education Leader Training Program

Sponsors:

College of Education
University of Maine at Orono

U.S. Office of Education

Program Directors:

John W. Butzow, Ed.D.

Bernard R. Yvon, Ed.D.

Program Associate:

Gregory W. Marshall

Session #1 Introduction-Length-Temperature

1. Greetings and introduction of the staff.

2. Introduction to the program.

   A. Objectives

      (1) To provide basic instruction in the use of metric (SI) measurement.

      (2) To train a statewide group of metric leaders capable of offering metric education in Maine communities.

   B. Sponsorship

      (1) U.S. Office of Education

      (2) College of Education, University of Maine at Orono

   C. Schedule of meetings (sample schedule attached)

      (1) A schedule was provided to each participant with additional information concerning cancellation due to weather.

   D. Overview of program.

      (1) Session #1 Introduction-Length-Temperature

      (2) Session #2 Volume/Capacity-Mass/Weight

      (3) Session #3 Metric Advocacy-Length-Area-Temperature

      (4) Session #4 Metric Education Resources

      (5) Session #5 Metric Education Planning-Metric Olympics-Final Evaluation

3. Collection of data.

   A. Attendance/Needs Assessment-Attendance-Metric Needs (attached)

   B. Biographic Data Questionnaire (attached)

   C. Cognitive Pre-test- Metric Quiz for Session #1 (attached)

   D. Affective Pre-test- Opinionnaire About Metrics (attached)

4. Distribution of metric education packet including:

A. An Everday Guide to the Metric System
Science Research Associates, Inc.

Associated Press Books
50 Rockefeller Plaza
New York, N.Y. 10020

B. "Think Metric" Bumper Sticker
National Council of Teachers of Mathematics

National Council of Teachers of Mathematics
1906 Association Drive
Reston, Va. 22091

C. 30 cm ruler

D. 1 m length of string

E. Maine Official Transportation Map

F. Celsius thermometer

5. General orientation to the metric world

A. Overview of the system-lecture, transparencies, demonstration

(1) Prefixes

(2) Intrarelationships of units within one unit e.g. length

(3) Interrelationship of units e.g. length to area to volume to mass

6. Length

A. Scavenger hunt

Participants find ten items approximately one meter long. After discussion of the choices, the activity is repeated for centimeters. Participants use the appropriate uncalibrated metric length (flexible plastic strips or cubes) to use as a reference. They are directed to estimate the length of the chosen object before comparing it to the uncalibrated length.

B. Introduction to the meter stick

(1) Before calibrated meter sticks are distributed, a long object such as a table is measured. Participants are directed to perform the following measurements on the table:

3/4

length in whole meters
length remaining in whole centimeters.

Participants working in small groups leave in place meter lengths and centimeter cubes.

Participants complete Response Form 1.1 (revised)-(attached)

(2) Distribute meter sticks to be kept by participants and describe the instrument.

(3) Distribute 1.5 m vinyl tapes and form groups of 5-6 people. Participants estimate, measure, and record measurements on p.51 of An Everyday Guide to the Metric System.

C. Introduction to the millimeter

(1) Explain the use of the millimeter scale on the 30 cm ruler and have participants measure 3 sizes of photographic film in both centimeter and millimeter units.

D. Introduction to the kilometer

(1) Participants measure distances on Transportation Map using string and scale on map. They measure distance from particular metric training center to 7 other centers located at:

Bangor
Waterville
Auburn
S.Portland
Millinocket
Presque Isle
Van Buren

(2) Using An Everyday Guide to the Metric System, conduct activity 15, pp. 17-18 and measure distances on a map of the United States.

7. Temperature

A. Introduction to the Celsius thermometer.

(1) Explain use of the thermometer and direct participants to use thermometers daily.

8. Homework (attached)

A. Preliminary report on metric education to be offered by participants.

(1) Groups to work with.
(2) Measurement needs of these groups.
(3) Need for instructional materials.

9. Evaluation (attached)

Session #2 Volume/Capacity-Mass/Weight

1. Introduction

   A. Description of the progress of the metric leader program - number of participants, backgrounds of participants, general results of Session #1 evaluation, specific evaluation for site, results of needs assessment.

   B. Attendance/Needs sheet-complete as in Session #1

2. Review of measurement units for volume/capacity and mass/weight

3. Description of activity center approach.

   A. Distribute activity packet-Metric Activity Centers (attached)

   B. Describe activities.

   C. Describe process of working in pairs to complete activities during two activity hours.

4. Activity Hour #1

   A. Partners are responsible for completing at least 3 volume/capacity or 3 mass/weight activities in the basic category plus optional or other basic activities of their choice.

   B. Program directorsact as resource coordinators in each activity area.

   C. Workshop participants evenly divided between volume/capacity and mass/weight centers.

5. Reconnoiter

   A. Questions, problems, additional information related to activity hour#1 and introduction to activity hour #2.

6. Activity Hour #2

   A. Partners responsible for completing at least 3 volume/capacity or mass/weight activities in the basic category plus optional or other basic activities of their choice.

   B. Groups are switched from Activity Hour #1.

7. Metric Concerns

   A. Questions concerning homework assignment from Session #1

   B. Community Metric Work (attached)

8. Evaluation (attached)

Session #3 Metric Advocacy-Length-Area-Temperature

1. Reaction to metric articles-small group activity A.
   - A. Form small groups of 5-6 people.
   - B. Distribute article packet- The Nasty Gram ng (attached)
   - C. Groups determine five arguments to refute and five arguments to be accepted.
   - D. Groups develop a group report.
   - E. Group report of best rebuttal and point of argument to be accepted.
2. Interest group needs-small group activity B.
   - A. Form small interest groups of similar occupations. 4 people
   - B. Discuss Community Metric Work assignment from Session #2.
   - C. Plans for metric training.
   - D. Develop group report including specific needs, resources available for metric education, anticipated problems, information needed, etc.
   - E. Complete written report- Anticipated Needs (by group) (attached)
3. Break
4. Length/Area/Temperature Minisessions
   - A. Review units of area/temperature.
   - B. Describe minisessions-Synopsis of Session #3 Activities and activity booklet (attached)
   - C. Partners select and complete activities described in the activities booklet.
5. Homework-Tentative Metric Session Plan (attached)
6. Evaluation (attached)

Session #4 Metric Education Resources

1. Needs Assessment Report

   A. General and site-specific report on metric education needs developing out of Session #1 homework assignment and Session #3 Anticipated Needs report.

2. Lecture: "Do's and Don'ts of Metric Education"

   A. Summary of main points:

      (1) Base metric instruction on heirarchy of measurement learning skills.

      (2) Build intuitive reference points to encourage estimationfirst and then measurement skills.

      (3) i. fix unit intuitively; ii use the whole unit in estimating and measuring; iii use the unit and subunits in estimating and measuring.

      (4) Emphasize one basic unit per training session.

      (5) Build in opportunities to use the metric system at home and on the job during training.

      (6) Be consistant and apply metrics in all aspects of your daily life.

      (7) Learnand seek to meet the measurement needs of the people you are training i.e. teach them only what they need to know.

      (8) Keep measurement activities and equipment simple and evaluate both hardware and software carefully.

      (9) Use audiovisual and lecture methods in the right places and never as a substitute for measurement activity.

      (10) Resist the use of customary units and refer to them only in terms of aboutness.

      (11) Recognize and deal constructively with peoples' fears and resistance to change.

      (12) Know the status of metric conversion in your community, state, nation and world.

3. Resource Scavenger Hunt

   A. Description of resource packet-Metric Education Resources (attached)

   B. Participants peruse equipment, software, catalogs, audiovisual materials while completing Metric Scavenger Hunt (attached).

4. Film: "Meters, Liters, and Kilograms or How to Weigh Water with a Stick"

   Film Library
   Instructional Systems Center
   University of Maine at Orono
   Shibles Hall
   Orono, ME 04473

   A. Discussion of approach and uses of film.

5. Planning homework for Session #5

   A. Describe Metric Education Planning Guide. (attached)

   B. Describe Metric Education Planning Booklet. (attached)

6. Evaluation (attached)

Session #5 Metric Education Planning-Metric Olympics-Final Evaluation

1. Introduction
   - A. Information on receiving credit for workshop- [illegible]
   - B. Instructions for completing final report form-Metric Education Report (attached)
2. Metric Education Planning
   - A. Reaction to Session #3 homework assignment and additional ideas for metric education.
3. Metric olympics and cooking
   - A. Divide into five member teams and complete Entry Form. (attached)
   - B. Instructions and rules.
   - C. Complete olympic events and make refreshments as a team. Metric Olympics (attached); Metric Recipes (attached)
   - D. Presentation of prizes and awards.
4. Final Evaluation
   - A. Cognitive Post-test- Metric Quiz for Session #5 (attached)
   - B. Affective Post-test- Opinionnaire About Metrics (attached)
   - C. Evaluation (attached)

Workshop Schedule

Maine Metric Education Leader Training Program

Stearns High School

6:30-9:30 P.M.

Monday, December 5, 1977	Session #1	Introduction to Metric Education Program Length Temperature
Wednesday, January 25, 1978	Session #2	Length Area Metric Concerns
Wednesday, February 8, 1978	Session #3	Volume Temperature
Wednesday, March 15 1978	Session #4	Weight Methods of metric instruction
Monday, April 3, 1978	Session #5	Methods of metric instruction Follow-up training programs

Each workshop will take place at the time and location noted above ubless each participant is notified of a change in schedule.

In case of bad weather and hazardous driving conditions, you can determine whether or not a workshop will be held by:

Attendance
Metric Needs

Session: #1 #2 #3 #4 #5 (circle)

Site: Bangor Van Buren Waterville S.Portland

Millinocket Presque Isle Auburn (circle)

Name:____

Address:______________________________________

____

Telephone:________________

I have the following needs related to the metric measurement system:

(1)

(2)

(3)

(4)

(5)

Occupation:______________________________________

BIOGRAPHIC DATA QUESTIONNAIRE

1. Occupation: ______________________________

2. Sex: (Circle one) M F

3. Race: (Check one)

   White __________

   Black __________

   Native American (Indian) __________

   Other (Specify) __________

4. Age: (Check appropriate line)

   Under 20 __________
   20 - 30 __________

   31 - 40 __________

   41 - 50 __________

   51 - 60 __________

   Over 60 __________

5. Employer

   Where do you work?

   a. Name of firm or organization: ______

   ____

   b. Address: ______________________________

   c. Describe your position: __________

   ____

6. Marital status (Check one)

   Single ________

   Married ________

   Separated ________

   Divorced ________

   Widowed ________

(continue on opposite side)

7. Number of people or residents in the household where you live: ____________________

8. What nationality, if any, do you claim?

____

9. Educational Background (Check level completed)

8th grade ____________

some high school ____________

High School graduate ____________

Some college ____________

College graduate ____________

College graduate plus ____________

Other (Specify) ____________

10. How did you find out about this training program?

____

____

11. Why did you choose to attend these sessions?

____

____

____

Name ____

Social Security Number ______________________________

Metric Quiz for Session #1

Note for questions number one through four, please refer to the coffee cup distributed by the workshop leaders.

1. The distance across the top of the coffee cup is about ____________ centimeters (cm)
2. The temperature of the water being placed into the cup is about ____________ degrees celsius. (C°)
3. How much does the coffee cup together with the water in it weigh? ____________ grams (g)
4. How much water does the cup hold in milliliters? ____________ milliliters (ml)
5. My guess of the temperature in this room is about ____________ degrees celsius. (C°)
6. Please try to look at Bernie Yvon. His height is about ____________ centimeters (cm)
7. The height of this room is about ____________ meters (m)
8. Make two marks on the line below showing a distance of 35 millimeters (ml)
9. Greg Marshall is holding up a pail (he often does this as a pastime). How many liters of water could Greg put into the pail without getting wet? ______________ liters (l)
10. Look at John Butzow if you care to. He tips the scales at about ____________ kilograms (kg)

Thanks for your cooperation, you are now on the way to METRIC$...............

Name:______________________________
Soc. Sec. #______________
Pre____ Post____

OPINIONNAIRE ABOUT METRICS

Directions: Below are ten questions that deal with the metric system. Each item is followed by a line that represents a range of opinions you might hold. Please decide how you feel about each item and place an (X) at the point on the line that most closely reflects your opinion.

1. How well do you understand the metric system of weights and measures?

____

A Great Deal of Understanding	No Understanding

2. How much do you use metrics in your personal and/or professional life?

____

Use Metrics All the Time	Never Use Metrics

3. How comfortable do you feel with information reported in metric units?

____

Extremely Comfortable	Extremely Uneasy

4. How important do you believe it is for everyone to learn the metric system of weights and measures?

____

Extremely Important	Extremely Unimportant

5. How confident do you feel that you can help other people learn the metric system?

____

Very Confident	No Confidence

(Continue on opposite side)

6. What responsibility do you believe you have to help other people learn the metric system?

____

A Great Deal of Responsibility — No Responsibility

7. How important do you believe it is for all Americans to accept and use the metric system of weights and measures?

____

Extremely Important — Extremely Unimportant

8. How soon do you believe the United States' government should convert to the metric system?

____

Immediately — Never

9. How important do you believe it is for the United States' government to set an exact date for the conversion to the metric system?

____

Extremely Important — Extremely Unimportant

10. How soon do you believe businesses and industries should convert to the metric system?

____

Immediately — Never

Response Form 1.1 (revised)

Length of a Table

Measured lengths of table

A. Whole meter sticks________

B. Number of centimeter cubes beyond meters________

Part I. Convert the table measurement to meters.

________ m

Part II. Convert the table measurement to centimeters.

cm

Homework Assignment

At the conclusion, or possibly during the workshop phase of the Maine Metric Education Leader Training Program you will be training others in metrics. The training you offer will vary according to your interests and the groups of people with whom you are associated.

We would like you to begin thinking about the kinds of training you might give by completing the following assignment and bringing it with you to the next meeting.

(1) Identify the group(s) to whom you might offer metric education:

(2) What are the metric measurement needs of the people in these groups?

(3) What kinds of instructional materials might you need in order to help the people in these groups learn the metric system.

PLEASE REMEMBER:

The purpose of the Maine Metric Education Leader Training Program is to help you to think in metric terms and to assist you in discovering ways to train others.

Name: ______________________________
Soc. Sec. # ______________
Pre____ Post____

EVALUATION OF THE TRAINING SESSION

Directions: Please take a few minutes to respond to the four items below. Your response will help us to evaluate this training session and to identify ways to improve future training sessions.

1. What is your over-all impression concerning the effectiveness of this training session?

Very Effective	Effective	Ineffective	Very Ineffective

2. Please identify one or more strength(s) of this training session.

3. Please identify one or more weakness(es) of this training session.

4. Please identify one or more way(s) you feel we could improve future training sessions.

METRIC ACTIVITY CENTERS

Basic Activities:

Volume/Capacity

V/C-1	Guess a Little Volume Estimating and measuring the capacity of various small containers using water.
V/C-2	The Volume of Your Shoe Estimating and measuring the capacity of irregularly shaped objects using dry materials.
V/C-3	Big Volume Matchup Estimating the volumes of premeasured containers.
V/C-4	The Whole Indoors Estimating and measuring the volume of a room.
V/C-5	Make a Liter Measurer Making a metric volume measuring instrument.

Mass/Weight

M/W-1	Guess a Little Weight Ordering, estimating and measuring the weight of light objects.
M/W-2	Guess a Big Weight Ordering, estimating and measurings the weights of heavier objects.
M/W-3	Heavyweight Matchup Estimating the mass of premeasured objects.
M/W-4	A Ton of People Determining a number of people who weigh a metric ton.
M/W-5	One Potato, Two Potato Finding the best bargain on potatoes.

Optional Activity
Mass/Weight

Opt. M/W-1	Metric Consumer Checking labels and unit pricing consumer items.

METRIC ACTIVITY CENTERS (cont.)

Opt. M/W-2	Another Way to Measure Volume Measuring volume using water.
Opt. M/W-3	Dense Woods Finding the specific gravity of various woods.

Optional Activity
Volume/Capacity

Opt. V/C-1	How Much Air is There? Measuring engine displacement and lung capacity.
Opt. V/C-2	Measure Down Measuring kitchen volumes and converting recipes.

V/C-1

Guess a Little Volume

Find a Partner

Materials: miscellaneous size and shape containers, graduated cylinders and pitchers, water.

What To Do: (use whole numbers only)

1. Select any five containers.
2. Arrange them in order from smallest to largest capacity by eye only.
3. Guess the capacity of each in milliliters and record your estimate.
4. Test out your guesses using the graduated cylinders and pitchers and record.
5. Subtract each estimate from the actual capacity.
6. Add all of these differences together, divide by five and round off your answer to the nearest whole number.
7. This is your "error index"--how did you do? (the smaller the number the better.)

COMPARE RESULTS WITH YOUR PARTNER

8. Replace materials as found and clean up.

The Volume of Your Shoe

Find a Partner

Materials: cereal, sand, your shoes, boxes, hats, purses, pockets, rice, packing materials, etc.

What To Do: (use whole numbers only)

1. Select any five containers from those on the table or use others of your choice.
2. Arrange them in order--which holds least to most, by eye only.
3. Guess the capacity of each and record your estimate.
4. Test out your guesses for each with sand, rice, or packing material using graduated containers and record.
5. Subtract each estimate from the actual capacity.
6. Add all of these differences and divide by five.
7. This is your "error index"--how did you do? (the smaller the number the better.)

COMPARE RESULTS WITH YOUR PARTNER.

8. Replace materials as found and clean up.

V/C-3

Big Volume Matchup

Find a Partner

Materials: miscellaneous prefilled containers, trays.

What To Do:

1. From the containers, which ones correspond to the following volumes below and then place them on the appropriate mats on the table.
2. Use the graduated cylinder scales to see if you were right.

COMPARE RESULTS WITH YOUR PARTNER

3. Replace materials as found and clean up.

Tray #1	Tray #2	Tray #3	Tray #4	Tray #5
85 ml	110 ml	230 ml	275 ml	375 ml

The Whole Indoors

Find a Partner

Materials: 10 meter tape measure or meter sticks, 1.5 meter cloth tape measurers, trundle wheel.

What To Do:

1. Estimate the volume of the room in cubic meters (m^3).
2. Measure length, width and height of the room in meters (m).
3. Calculate the volume of the room ($v=l \times w \times h$)
4. How far off were you in your estimate?
5. Estimate and measure the volume of other large items in the room or nearby such as candy machine, coffee machine, auto, etc.
6. Replace material as found and clean up.

Make a Liter Measurer

Find a Partner

Materials: a half-"beep" milk carton, liter pitcher, source of water, metric ruler, funnel, permanent marking pen, knife, 10 cm straight edge, large bottle.

What To Do:

1. Use one half-"beep" milk carton per group.
2. Using a 1.0 liter graduated pitcher, pour 1.0 liter of water into the milk carton. Since you are using the liter pitcher as a standard, be as accurate as possible in measuring and pouring.
3. Measure the depth of the water in the container with a metric ruler. __________ cm
4. Pour the water back into the pitcher and cut the container at a height 2 cm above the water level.
5. Measure another 1.0 liters of water into the container and measure as accurately as possible the depth of the water. __________ mm
6. Pour the water from the container and mark the one-liter fill line on the inside perimeter of the carton using the permanent marking pen. You may want to mark the fill line with masking tape on the outside of the container.
7. Using the metric ruler mark the .25ℓ, .50ℓ and .75ℓ fill lines. The .25ℓ line will be one-fourth the distance from the bottom. The .50ℓ line will be one-half the distance from the bottom, etc.
8. Replace materials as found and clean up.

What To Do: (time permitting.)

1. Estimate the volume of a large bottle. __________ ℓ
2. Can you determine the approximate volume in ml of the bottle by pouring water only once into or out of your graduated container? __________ ℓ.

Guess a Little Weight

Find a Partner

Materials: miscellaneous lighter items of different sizes and shapes, scales and/or balance beams and weights.

What To Do: (use whole numbers only.)

1. Select any five items.
2. Arrange them in order, lightest to heaviest by feel only.
3. Guess the weight of each item in grams, and record your estimate.
4. Weigh each of the items and record.
5. Subtract each estimate from actual weight.
6. Add all of these differences and divide by five. Round your answer to the nearest whole number.
7. This is your "error index"--how did you do? (the smaller the number the better.)

COMPARE RESULTS WITH YOUR PARTNER.

8. Replace materials as found and clean up.

Guess a Big Weight

Find a Partner

Materials: miscellaneous and heavier items of different sizes and shapes needed, scales and/or balance beams and weights.

What To Do: (use whole numbers only.)

1. Select any five items.
2. Arrange them in order lightest to heaviest (by feel only).
3. Guess the weight of each item in grams and record your estimate.
4. Weigh each of the items and record.
5. Subtract each estimate from actual weight.
6. Add all of these differences and divide by five. Record your answers to the nearest whole number.
7. This is your "error index"--how did you do? (the smaller the number the better.)

COMPARE RESULTS WITH YOUR PARTNER.

8. Replace materials as found and clean up.

Heavy Weight Matchup

Find a Partner

Materials: rocks, clay, trays.

What To Do: (use whole numbers only.)

1. From the rocks and clay forms, guess which ones correspond to the following weights below and place them on the appropriate tray on the table (by feel only).
2. Use the scales to see if you were right--compare notes with your partner.
3. Replace materials as found and clean up.

Tray #1	Tray #2	Tray #3	Tray #4	Tray #5
65 g	200 g	340 g	650 g	1500 g

A Ton of People

Find a Partner

Materials: bathroom scales and at least 3 pairs of partner.

What To Do:
1. Estimate and then weigh each participant.
2. Find people outside the working group whose estimated weight totals 1000 kg or 1 metric ton.
3. Weigh the selected people to determine how well the group estimated a metric ton.
4. About how many people make up a ton.
5. Replace scales.

One Potato, Two Potato

Find a Partner

__Materials:__ 5 marked sacks of potatoes, large spring balance.

__What To Do:__

1. Guess the order of best to worst bargain price for the 5 bags of potatoes.
2. Check your estimates by weighing and calculating the unit price in cents per kilogram.
3. Which bag is the best buy?
4. Replace bags ready for next group.

Metric Consumers

Find a Partner

Materials: 1.0 kg, 0.5 kg, 0.2 kg, and 0.1 kg mass, two cereal brands with empty containers, two detergent brands with empty containers, and a balance.

What To Do:

1. Familiarize yourself with the kg by holding a 1.0 kg, 0.5 kg, 0.2 kg, and 0.1 kg mass in your hand.

2. With one or more mass pieces in one hand and one of the items below in the other hand, estimate the mass of each item in kg. DO NOT CHECK THE LABEL ON THE BOX! Estimated Weight (kg).

   cereal #1 cereal #2 detergent A detergent B

3. Using a metric scale, weigh each of the items and determine the difference between your estimated weight and the measured weight. Measured Weight (Kg). Difference (kg).

   cereal #1 cereal #2 detergent A detergent B

4. Determine the weight of each empty container for each item and, by subtraction from the total weight, find the weight of the contents. Total Weight (gm). − Container Weight (gm) = Weight of Contents (gm).

   cereal #1 cereal #2 detergent A detergent B

   Refer to the label to determine whether or not the weight is accurately labeled.

5. Determine the unit price (price per gram) of each item by dividing the price by the weight in grams. Unit Price ($/gm).

   cereal #1 cereal #2 detergent A detergent B

   If you were basing your decision to buy one of these cereals and one of these detergents on the basis of price alone, which would you buy?

6. Replace materials as found and clean up.

Note: The metric system offers a definite advantage to the consumer who compares prices. For example, the following problem;

Determine the unit price (cost per ounce) of two brands of cheese:

		Unit Price
1.0 lb Cheese A	$2.00	
14 oz. Cheese B	$1.60	

Now determine the unit price (cost per gram) of these different brands of cheese:

		Unit Price
0.5 kg Cheese C	$2.50	
600 gm Cheese D	$2.80	

In making your calculations, did you discover the inherent advantage of metric labeling?

Another Way to Measure Volume

Find a Partner

Materials: balance with liter pans, top loading balance (>100g), student double pan balance and weight set, 6 containers of irregular shape ranging from 5 mℓ to about 1000 mℓ.

What To Do: First you and your group will find the relationship between the weight of water and its volume. Using the balance with cubic style liter capacity pans weigh 200, 500 and 1000 mℓ of water. Divide the volume of the water by its weight. Now calculate the average relationship between weight and volume for water:

200 mℓ $\frac{200\ \text{m}\ell}{\_\_\_\_\_\_\ \text{g}}$ = __________ mℓ/g

500 mℓ $\frac{500\ \text{m}\ell}{\_\_\_\_\_\_\ \text{g}}$ = __________ mℓ/g

1000 mℓ $\frac{1000\ \text{m}\ell}{\_\_\_\_\_\_\ \text{g}}$ = __________ mℓ/g

Average = ____________________ g/mℓ

(Please consult with the workshop leader before going past this point.)

Now each group member should select a pet container to measure volume by weighing.

First, record estimates of volume then empty and filled weights. The actual volume is the final weight minus emptying weight times the volume of one gram of water (the average value from your earlier work.

Replace materials as found and clean up.

opt M/W-2

Group results, volume by weighing.

Item	Estimated Volume in mℓ	Filled Weight in Grams	Empty Weight in Grams	Actual Volume in mℓ
1				
2				
3				
4				
5				
6				

opt M/W-3

Dense Woods: Specific Gravity of Wood Samples

Find a Partner

Materials: balance, 250 mℓ beaker, water, probe, wood samples.

What To Do:

1. Use the balance provided to find the mass of a sample block of wood which you select. Measure to the nearest .01 gm thoughout this activity. Mass of wood sample = __________ gm.

2. Fill the 250 mℓ beaker with 150-200 mℓ of water.

3. Find the mass of the beaker and water to the nearest .01 gm. Do not remove the beaker from the balance pan. Mass of beaker and water = __________ gm.

4. Using a sharp probe, pick up your wood sample. i.e. spear the sample.

5. Submerge the wood on the end of the probe in the beaker on the balance. Be careful not to touch the bottom or sides of the beaker.

6. Read the measurement on the balance when the wood sample is submerged. Mass of beaker and water and submerged wood sample = __________ gm.

7. Subtract the mass of the beaker and water (3) from the mass measured in (6) to give the mass of the water displaced by the submerged wood. Mass of water displaced = __________ gm.

8. The specific gravity is defined as the ratio of the mass of a body to the mass of an equal volume of water.

$$\text{specific gravity} = \frac{\text{mass of wood sample (1)}}{\text{mass of water displaced (7)}} = \underline{\qquad\qquad}$$

Find this ratio for your piece of wood.

Accepted values of the specific gravity for different woods available for this activity are:

	Handbook of Chemistry and Physics	Metrication for the Pulp and Paper Industry
Redwood	0.44	0.38
Yellow poplar	0.43	0.38
Ironwood	1.08	----
Sugarmaple	0.68	0.56
Tamarack	0.56	----
White oak	0.71	0.59

9. Can you use the specific gravity of the wood sample which you determined to identify the wood?

10. What factors might cause the density of wood in the same species to vary? These may be the factors which will make your value for the specific gravity different from accepted values which differ among themselves as you can see from the table given.

How Much Air is There?

Find a Partner

Materials: Part A: small engine and a metric ruler.

Part B: 4ℓ bottle, glass bends and connecting tubing, 1ℓ pitcher, soda, straws.

What To Do: Part A: The Displacement of an Engine

The power of a gas engine is usually related to the volume inside the cylinder when the piston is in its lowest position. This volume (usually measured in cubic centimeters cm^3 for small engines and in liters for large engines) is called the displacement of the engine. Chain saws range from about 50 cm^3 to about 150 cm^3, snowmobile engines from 250 cm^3 to 600 cm^3. Automobile engines range from 1.4 liters for the smallest subcompact to 7 liters for a supermonster.

1. Rotate the crankshaft of the engine until the piston reaches its lowest point in the cylinder.

2. With the ruler measure the stroke (depth) of the cylinder in cm units. See diagram.
   Stroke = __________ cm

3. Measure the bore (diameter) of the cylinder in cm units. See diagram.
   Bore = __________ cm

4. Calculate the area of the pistons surface which equals $\text{bore}^2 \div 4 \times \pi$.
   Area = __________ cm^2

5. Calculate the volume (displacement) of the cylinder which equals area x stroke.
   Volume (displacement) = __________ cm^3
   Volume (displacement) = __________ ℓ

   Volume (displacement) = area x stroke

   Refer to next page for other specification for a metric car.

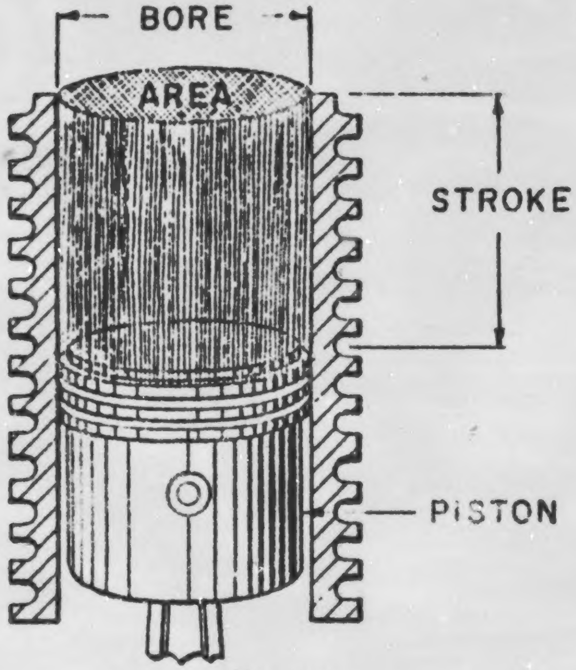
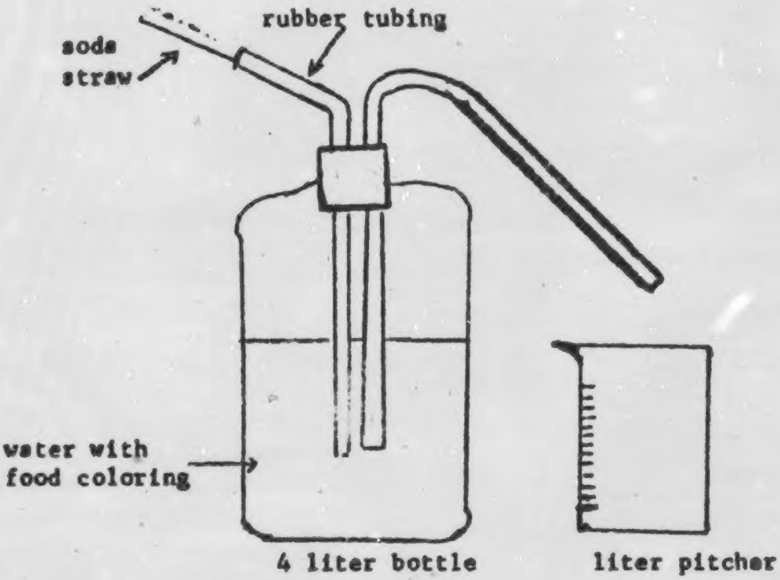
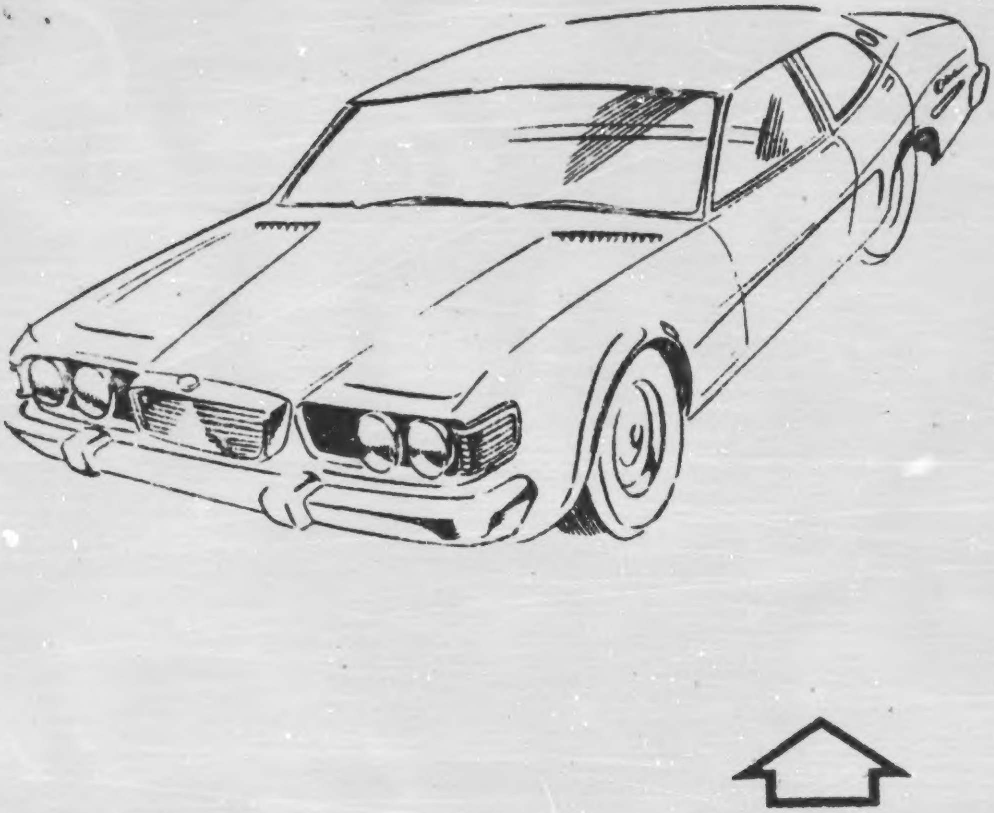

BORE
AREA
STROKE
PISTON

Fig. 35-8
Method for figuring engine displacement. Volume in cubic centimetres of one cylinder equals area times stroke.

Part B: Capacity of Your Lungs.

Diagram of Apparatus


soda straw
rubber tubing
water with food coloring
4 liter bottle
liter pitcher



65 kW	←	Power	→	280 kW
150 km/h	←	Top Speed	→	195 km/h
2.3 litres (2300 cm³)	←	Displacement	→	7.0 litres (7000 cm³)
6 to 8 l/km	←	Fuel Consumption	→	15 to 24 l/km
900 kg	←	Weight (mass)	→	2.2 t
4200 mm	←	Length	→	6000 mm
4.7 litres	←	Oil Capacity	→	5.7 litres
14 litres	←	Cooling System	→	24 litres
40 litres	←	Gasoline Tank	→	85 litres
0.2 m³	←	Luggage Capacity	→	0.6 m³

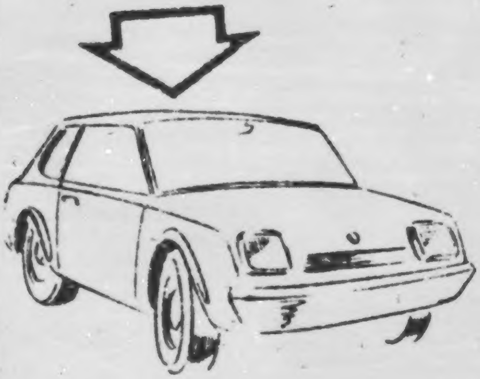


Fig. 35-3
Specifications for a metric car.

What To Do:

1. Connect a fresh soda straw to the rubber tube leading into the bottle.

2. Take a normal breath and exhale vigorously through the soda straw to push a volume of water equal to your lung capacity into a liter pitcher.

3. Measure the water displaced into a liter pitcher and record the lung capacity of one member of your team.

   ________ cm^3 or ________ ℓ

4. Before repeating the activity for the second team member, estimate his or her lung capacity based on factors such as amount of daily exercise, history of smoking, and physical size.

   Estimate of lung capacity = ________ cm^3
   Measured lung capacity = ________ cm^3

opt V/C-2

Measure Down

Find a Partner

Materials: eye droppers, source of water, teaspoons, tablespoons, measuring cups, metric spoons, metric cups.

What To Do: A. 1. Using an eye dropper and a 10 mℓ graduated cylinder, measure the number of drops of water in 5.0 mℓ. Repeat this measurement two more times.

Measurement #1 __________ drops
Measurement #2 __________ drops
Measurement #3 __________ drops

2. Find the average number of drops in 5.0 mℓ of water. = __________ drops.

3. Find the number of drops in 1.0 mℓ of water to the nearest whole drop. = __________ drops/mℓ.

B. 1. Using an eye dropper, determine the number of mℓ in a conventional teaspoon. = __________ mℓ/tsp.

Does the number of mℓ in a teaspoon nearly correspond to the volume of any of the metric measurement spoons or combination of metric measurement spoons?

C. 1. Using an eye dropper find the number of mℓ of water in a conventional tablespoon. = __________ mℓ/tbs.

Does the number of mℓ in a tablespoon nearly correspond to the volume of any of the metric measurement spoons or combination of metric measurement spoons.

D. Using the metric measuring cups and spoons find the number of mℓ in a conventional measuring cup. = _____ mℓ/cup

E. If you have metric utensils, but want to use old recipes, then you will need to convert your recipes to metric units. Using the information which you found in this activity, how would you convert the following recipe to a metric recipe:

DANISH TOFFEE COOKIES

3½ cups sifted cake flour	1 cup granulated sugar
2 teasp. double-acting baking powder	1 large egg, unbeaten
2/3 cup soft butter or margarine	2 tablesp. very strong coffee
½ teasp. salt	1½ tablesp. dark rum
	½ cup finely chopped blanched almonds

Sift flour with baking powder. Cream butter with salt until light and fluffy, gradually adding sugar. Add egg, then coffee, then rum, beating well after each addition. Blend in flour mixture, then almonds. Refrigerate about 2 hr., or till dough can be easily handled.

To bake: Start heating oven to 375°F. On floured surface, roll dough 1/8" to 1/4" thick. Cut with floured 2 1/4" cutter. On ungreased cookie sheets, bake 10 to 12 min., or until done. Makes about 4 doz.

Notes: The Metric Recipe Problem

If you are going to cook metrically, the easiest way to begin is with a set of metric cooking tools and utensils and a metric cookbook in which the recipes are written in metric units. Sources of metric cooking equipment and recipes include the following:

Corning Glassworks
Corning, NY

The Metric Shop
Box 392
720 Cayuga Street
Lewiston, NY 14092

NASCO
901 Janesville Avenue
Fort Atkinson, Wisc. 53538

American Home Economics Association
2010 Massachusetts Avenue, N.W.
Washington, DC 20036

ENRICH
760 Kifer Road
Sunnyvale, CA 94086

If you do not have metric utensils, don't have metric recipes, and don't give a hoot then good luck! You could starve!

Community Metric Work

I. In your home or place of business, how are metrics being used or taught? Discuss the uses of metrics with coworkers, supervisors, family to find out what they are doing, how much they know, and how they feel.

II. What metric measurement equipment is available in your community? (Local stores, businesses, school, your home) Can you find metric measurement equipment that you need locally?

III. What items being sold in your community are being measured in metric units? How are they labeled? Metric units only? Metric and common units?

Bring your notes on these findings with you to Session #3 when we will be discussing them in small groups.

Name: ______________________________

Soc. Sec. # ______________

Pre____ Post____

EVALUATION OF THE TRAINING SESSION

Directions: Please take a few minutes to respond to the four items below. Your response will help us to evaluate this training session and to identify ways to improve future training sessions.

1. What is your over-all impression concerning the effectiveness of this training session?

Very Effective	Effective	Ineffective	Very Ineffective

2. Please identify one or more strength(s) of this training session.

3. Please identify one or more weakness(es) of this training session.

4. Please identify one or more way(s) you feel we could improve future training sessions.

The Nasty Gram ng

Your group is to read one or more of the reproduced articles that follow. Formulate 5 statements in rebuttal to any points raised in the articles.

1.

2.

3.

4.

5.

Select 5 points that you find impossible to rebut and think are legitimate. We probably should accept these and learn to live with them during conversion.

1.

2.

3.

4.

5.

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Anticipated Needs (by group)

Type of group ______________ Site ___________________

Some points to consider in your group discussion.

a. What kinds of people will you be training?

b. What are their metric needs specifically?

c. What resources will be available to help you in your training?

   1. people
   2. equipment
   3. reference material

d. What is the present status of metrics in your community/place of business and how will it affect what you will do?

e. As metric leaders, what are your obligations to the community at large?

HOW CAN WE BE OF ASSISTANCE TO YOU AS YOU PREPARE TO CONDUCT YOUR SESSIONS--EG. TECHNICAL INFORMATION, ANY SPECIFIC NEEDS AND UNANSWERED QUESTIONS?

To be turned in at session #3.

Synopsis of Session #3 Activities

Length--Long (LL)

1. How long is a Kilometer.

   Using paces and a trundle wheel determine the length of hallways, schoolyards, etc.

2. Make your own trundle wheel

   With a bicycle wheel you can measure long distances.

3. To and fro your home

   With "topo" maps locate and measure distances to familiar places.

4. Determining aerial dimensions

   From the aerial photogram find the dimensions of familiar sites.

Length--Short (LS)

1. How thick is your hair

   Using a micrometer, find the thickness of objects.

2. Use a Vernier Caliper

   Find inside, outside dimensions of assorted items (tubing, pipes, etc.).

3. How thick is your head

   With bow calipers, diameter gauges, and inside-outside calipers find the dimensions of larger objects.

Area (A)

1. cm^2 area hunt

   Find the area of your book, table, window, etc.

2. How heavy is your foot

   Find out why your feet get sore by computing the amount of weight/cm^2 they support.

3. The old carpet trick

   How will the metric system affect rug purchasing and installation.

Area (cont.)

4. Putting on ares

   Build an are in your room and calculate hectares on a familiar "topo" map.

5. Kill-A-Pascal

   Using the metric gauge, compare the tire pressure in metrics with the more familiar unit.

Temperature (T)

1. When you're hot you're hot

   A scavenger hunt for a range of Celsius temperatures.

2. Keeping your cool

   Take your own metric temperature.

3. Mixed-up temperature

   Estimate and verify the temperature of various liquids. Try mixing a few.

4. If you can't stand the temperature--GET OUT OF THE KITCHEN

   Use an assortment of kitchen Celsius thermometers.

HOW LONG IS A KILOMETER

Materials: trundle wheel.

What To Do:

1. Using the trundle wheel, measure a distance of 10 m in the room or hallway. Be certain to mark the starting and ending point.

2. Pace off the 10 m distance and determine the number of steps which you take per meter. Pace off the 10 meters again to be sure that you have made this determination correctly.

3. Estimate the length of the hallway in meters. Record your estimate.

4. Pace off the length of the hallway and use the number of paces to determine the length of the hallway in meters and in kilometers.

5. Use the trundle wheel to measure the length of the hallway in meters.

6. Compare your estimated length, paced length and trundle wheel length.

7. How many paces would you take to travel the distance of 1 km.

   Estimated length of hallway = __________ m

   Paced length of hallway = __________ m or __________ km

   Measured length of hallway = __________ m

   Number of paces in 1 km = __________ paces

8. You may want to use the model for a metric speedometer (Fig. 10-7) to calibrate your automobile speedometer. This will enable you to measure your speed in km/hr.

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Name _______________ Metric Leader Site _______________

Tentative Metric Session Plan

1. What adult group do you intend to work with?

2. How do you plan to recruit and publicize for your session(s)?

3. Describe the physical location where you plan to hold you session(s).

4. What part(s) of the Metric System do you plan to cover?

5. How many sessions do you need to cover #4?

6. What printed material do you plan to develop and use?

7. Outline (with an appropriate time table) at least your first session.

8. How do you plan to determine the impact of your session(s)?

To be turned in at session #4.

Name: ______________________________

Soc. Sec. # ______________

Pre____ Post____

EVALUATION OF THE TRAINING SESSION

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Resource Guide for Metric Education

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ANSWERS TO QUESTIONS MOST OFTEN ASKED ABOUT TEACHING METRICS

1. Question: How do I begin?

   Answer: You don't need a warehouse of materials to begin teaching the metric system. Start with a few basic pieces of equipment, such as a bathroom scale marked off in kilograms, plastic rulers for each child, a meterstick and liquid measuring cylinders. This way the children can start learning about linear, weight and volume measurement, all for about $36. If individual teachers pool their school budget allotments for metric materials, a central resource center will soon develop that all teachers can borrow from. (For a listing of some of the new metric materials see "Tooling Up for the Metric Changeover," TEACHER, March, 1974, p. 90.)

   Other materials that might be needed can be produced by the children themselves. For instance, a 10-meter rule may be drawn and taped together to make individual metersticks; masking tape calibrated in centimeters and attached to a wall measures height; cubic centimeters may be cut from sponges and graph paper can be used to make square centimeters; milk cartons 10 centimeters high yield liters; cartons one centimeter high provide deciliters.

   Raisins placed in plastic bags offer students an opportunity to study weight concepts and a simple lesson in metric measurement. The children should quickly grasp the idea that if one raisin weighs approximately one gram, 10 raisins will weigh one dekagram; 100, one hectogram; 1,000, one kilogram. They'll find it easy to apply the same principle to different objects.

   And when children make their own metric kits, the concepts are concrete and portable for home use--to practice themselves and show (and instruct) their parents.

2. Question: How should I "kick off" my instruction?

   Answer: Using the metric scale, the height tape and the metric cylinders, the children can make a weight and height graph and measure a liter. They will be able to state their "new" metric weight in kilograms and their height in centimeters and actually see what a liter equals. Every child will be anxious to go home and talk about his "new" vital statistics.

3. Question: Is there a logical order to metrication instruction?

   Answer: Begin with linear measurement so the children will become familiar with the prefixes used in the metric system. From there explore area, weight, capacity and temperature measurement.

4. Question: Do we mention the "old" system?

Answer: Students handle the concept of metric measurement very easily, when there is no mention of mathematical conversions from the "old" to the "new" system. Though most mathematicians agree that time shouldn't be spent on conversion, there are two schools of thought on how to help students begin to "think metric." One promotes the parallel teaching of both systems, while the other encourages the inclusion of the metric system only.

5. Question: Should primary-graders begin learning metrication?

Answer: Yes. It's easiest to teach younger children since they haven't been exposed to our present English system over a long period. When these children reach adulthood, only the metric system is likely to be in use. Whether or not you decide to teach the systems parallel, young children have no built in reservations to "thinking metric".

6. Question: How can intermediates and older students begin learning metrication, if they have already been taught the English system?

Answer: Students as well as adults will probably be working in both systems until the country totally converts to metric measurement. However, the emphasis in teaching must be on experience with metric units, because eventually the metric system will be in constant use in daily situations. But this doesn't mean that students in the intermediate grades, who are already familiar with the English system, can't think of a meter as being just a bit longer than a yard or that you shouldn't answer their questions about conversion.

7. Question: Should metrication be taught in science or math classes?

Answer: Metrication involves science and math, as well as geography, social studies, sports, career awareness, cooking, and industrial arts--all areas of study. Introduce the metric system whenever linear, volume and capacity measurements are used.

8. Question: What is the educator's role in national conversion?

Answer: Teachers will be doing each community a great service by teaching students, as well as parents, about metric measurement. Workshop sessions for parents and all community members should be begun.

9. Question: Where can I get information on metric measurement?

Answer: Many sources are now being prepared by school districts, college government agencies, business and industry, and these materials are readily available. Some contain conversion tables that may be useful to adults--for their own information and for answering students' questions. Teachers should also shop around for commercial materials comparing prices, durability, practicality and clarity.

10. Question: How long will it take for the United States to transfer over entirely to the metric system?

Answer: Once the pending bills on metrication are passed and signed, the U.S. will have 10 years to convert.

Metric measurement is being used now in more areas than perhaps we realize--foreign cars, sports events, medicines, photography, canned foods, science classes and even cigarette packages. It is our task now to absorb the metric system into every aspect of our daily life.

11. Question: Should children be taught to convert from our present English system of measurement to the metric system?

Answer: 1. Children already familiar with the U.S. Customary Units or "English" system must learn the metric system as a second language of measurement. Therefore, students should be exposed to the metric system and continue working with the more familiar English system of measurement. They should be given a minimal amount of work with conversion in the upper grades.

2. Those children who are just beginning school and are not yet totally familiar with U.S. Customary Units should grow up bilingual in terms of measurement. They should be taught to think and communicate in both systems. Beginning in the first grade, children should be taught both systems of measurement so they can conceptualize and express length or weight in either form. For these students there is no need to convert from one system to the other.

3. Both the U.S. Customary and metric systems of measurement should be taught. Some people feel that children should learn only the metric system now. However, this is premature, since children will be living in an "English" world for a few years to come. The important thing is for children to grow up bilingually and gain increasing familiarity with the metric system. Therefore, in grades 1 through 8, both the U.S. Customary and metric systems should be taught but distinct from one another. As the emphasis gradually shifts to the metric system over the next few years, the children will easily adjust.

4. The bilingual approach to teaching measurement should extend beyond mathematics and manifest itself in those areas of measurement that also relate to science, social studies and all other parts of the curriculum.

12. Question: How are basic calculations made in the metric system and how do they compare in simplicity to calculations in customary units? Is it really easier to answer common problems in metric units?

Answer: Problem: What is the area of the floor of a room with the following dimensions?

Customary Units	Metric Units
Length--15 ft. 7 in.	475 centimeters
Width--12 ft. 6 in.	380 centimeters

Solution: The area is determined by multiplying the length of the room by its width. Note that for room dimensions given in mixed customary units it is necessary to first reduce them to a common unit expression which, in this case, may be either feet or inches.

Customary-- Room Dimensions in Inches	Metric-- Room Dimensions in Centimeters
Multiply feet by 12 to convert to inches	
Length--(15 x 12) + 7 = 187 in.	Length--475 cm
Width--(12 x 12) + 6 = 150 in.	Width--380 cm
187 x 150 = 28,050 square inches	475 x 380 = 180,500 square cm
Total square inches divided by number of square inches in a square foot (144) equals number of square feet.	Total square centimeters divided by number of square centimeters in a square meter (10,000) equals number of square meters; i.e. move decimal point 4 places to left.
28,050 ÷ 144 = 195 square feet (approx.)	180,500 ÷ 10,000 = 18 square meters (approx.)
Total square feet divided by number of square feet in a square yard (9) equals number of square yards.	
195 ÷ 9 = 22 square yards (approx.)	

What is the approximate total weight of the contents of a basket that contains the following items:

Weight

	Customary Units	Metric Units
Meat	4 lb. 9 oz.	2.07 kilograms
Potatoes	3 lb. 4 oz.	1.47 kilograms
Tomatoes	2 lb. 15 oz.	1.33 kilograms
Cereal	1 lb. 7 oz.	650 grams

Solution of Problem

Customary Weight in Ounces--Weight in pounds multiplied by 16 gives weight in ounces		Metric Weight in Grams
Meat--(4 x 16) + 9 =	73	2070
Potatoes--(3 x 16) + 4 =	52	1470
Tomatoes--(2 x 16) + 15 =	47	1330
Cereal--(1 x 16) + 7 =	23	650
	195	5520

195 divided by 16 = 12 lb. (approx.) or 5.5 kilograms (approx.).

Volume

What is the volume of the following two comparable but not equal mixtures:

	Customary Units	Metric Units
Milk	1 gal. 2 qt. 1 pt.	6.5 liters
Water	3 qt. 1 pt.	3.5 liters
Flavoring	½ pt.	250 milliliters

Solution of Problem

Customary Volume in Pints	Metric Volume in Milliliters	
Multiply gallons by 8, and quarts by 2 to convert to pints	6500	multiply liters by 1000 to convert to milliliters
	3500	
	250	
	10250	

Milk

(1 x 8 + (2 x 2) + 1 = 13

Water

(3 x 2) + 1 = 7

Flavoring ½

20½ ÷ 2 = 10 qt. (approx.) or 10.25 lite

10 ÷ 4 = 2½ gal. (approx.) or 10 liters (approx.)

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McFee, Evans E. "Education in Decimal Currency and the Metric System", School Science and Mathematics, Vol. 69, No. 7, pp. 644-646, October 1969.

"Metric Competency Goals", Arithmetic Teacher, Vol. 23, No. 1, pp. 70-71, January 1976.

"Metric System Ahead", NEA Research Bulletin, Vol. 49, pp. 109-112, December 1971.

"Metrication Urged by N.S.T.A. Committee", Science Teacher, Vol. 38, No. 1, pp. 6-7, January 1971.

Moss, Jeannette K. "Tooling Up for the Metric Changeover", Teacher, Vol. 91, No. 7, pp. 90-9, March 1974.

Murphy, M.O. and M.A. Polzin. "Descriptive Analysis of the Teaching of the Metric System in the Secondary Schools", Science Education, pp. 89-94, February 1969.

Nelson, Bess J. "Teaching the Metric System to Elementary School Teachers", School Science and Mathematics, Vol. 77, No. 2, pp. 122-124, February 1977.

Nelson, O. "Is Metric a Measure of Pain?", Industrial Arts and Vocational Education, Vol. 61, pp. 22-24, February 1972.

Oberline, L.C. "Let's Teach the Metric System Through Its Use", Arithmetic Teacher, Vol. 14, p. 376, May 1967.

Pottinger, Barbara. "Measuring, Discovering, and Estimating the Metric Way", Arithmetic Teacher, Vol. 22, No. 5, pp. 372-377, May 1975.

Sengstock, Wayne L. and Kenneth E. Wyatt. "Meters, Liters, and Grams: The Metric System and Its Implications for Curriculum for Exceptional Children", Teaching Exceptional Children, Vol. 8, No. 2, pp. 58-65, Winter of 1976.

Sparks, Richard K. "Metrics is Also a Social Study", Teacher, Vol. 92, No. 2, pp. 56, 58, 60, 62, October 1974.

Strong, E. "Meaningful Metric", School Science and Mathematics, Vol. 64, pp. 421-422, May 1964.

Swan, Malcolm D. "Experience, Key to Metric Unit Conversion", Science Teacher. Vol. 37, No. 8, pp. 69-70, November 1970.

"Think Metric", NEA Research Bulletin, Vol. 49, pp. 39-42, May 1971.

Thompson, Thomas E. "Ten Commonly Asked Questions by Teachers About Metric Education", Science and Children, Vol. 14, No. 5, pp. 14-16, February 1977.

Walker, Margaret. "Metric in the Kindergarten", Science and Children, Vol. 12, No. 6, p. 26, March 1975.

West, Tommie A. "Don't Just Think Metric--Live Metric", Arithmetic Teacher, Vol. 22, No. 2, pp. 103-110, February 1975.

INEXPENSIVE METRIC PUBLICATIONS

The following metric publications are available at a cost of no more than $2.50 from the respective suppliers. These materials have been screened by the METS Program for general acceptablility but have not been reviewed in depth; accordingly, some errors or inconsistencies may have slipped past us. A few of the publications use the "er" spelling but are included here because of their overall value. The materials have been organized by primary target audience, for your convenience.

Teachers

1. Coats and Clarks
   Consumer and Educational Affairs Department
   P. O. Box 1966
   Stamford, Connecticut 06902

   "Educator's Guide to Metric for Clothing Construction"
   Leaflet provides teaching ideas for applying metric to clothing construction. (8 pp., $0.25)

2. Instructional Materials Development Center
   2720 South Main Street
   Winston-Salem, North Carolina 27107

   "All Together Now - Teach Metrics" (1976)
   Includes materials developed for inservice workshops for K-8 teachers as part of the Winston-Salem/Forsyth County Metric Education Project, ESEA Title IVC. Activities chosen represent the kind proven most effective in project school classrooms. (55 pp., $2.00)

   "Criterion-referenced Metric Tests, Levels K-8 (Form A)" ($1.00)

3. Metro Cooperative Educational Service Agency (M-CESA)
   Attn: Harriet Harman, Publications Department
   2268 Adams Drive, N.W.
   Atlanta, Georgia 30318

   "Let's Go Metric" (by Brenda Tapp, Mathematics Coordinator, 1977)
   Activities booklet helps teachers familiarize themselves with the metric system of measurement. Activity cards most appropriate for elementary and middle school students. Useful bibliography contains list of books and pamphlets, periodical articles, and sources for metric information ($2.50)

   "Make It In Metric" (by Brenda Tapp, Mathematics Coordinator, 1977)
   Handbook of ideas for teacher-made metric material and games that can be made with a minimum of expense. (50 pp., $2.50)

4. National Council of Teachers of Mathematics
1906 Association Drive
Reston, Virginia 22091

"Metric Measurement Activity Cards" (published by Michigan Council of Teachers of Mathematics)
Over 100 metric activities along with ideas on how to use the cards and a list of other metric resource materials. ($2.00)

5. Wayne-Westland Community Schools
Project METRIC
646 N. Wayne Road
Westland, Michigan 48185

"Home Economics - Junior High"
Guide for teachers which includes activities to be used in the areas of cooking, sewing, interior decorating, child care, and food and nutrition. ($1.50)

"Industrial Arts - Junior High"
A compilation of ideas in the areas of drafting, metalworking, and woodworking. ($2.00)

"Olympmetrics"
Booklet describes many track and field events using the metric system of measurement. Based on the experience of the Wayne-Westland Community School District, the guide suggests a format for conducting a district-wide Metric Field Day competition. (40 pp, $1,50)

"Parent Workship Guide"
A guide to assist parents, teachers, and administrators in conducting a parent workshop. Includes suggestions for metric work stations, equipment, bulletin boards, and handouts. ($2.50)

General Public

1. American National Metric Council (ANMC)
1625 Massachusetts Avenue, N.W.
Washington, D. C. 20036

"The Metric System Day to Day"
Introduction to the metric system for employees, clients, and their families. Space on the front cover allows organization to print their own name and logo. (Imprinting information available from ANMC upon request.) Free sample copy available--send a 13¢ stamp and a mailing label. Multiple copies available at the following rates:

	Subscriber	Non-Subscriber
2-99 copies	25¢	30¢
100-999 copies	15¢	20¢
1000-9999 copies	10¢	15¢
5000-or more	8¢	10¢

(15 pp.)

(Also available from ANMC)

"Metrication and the Consumer: Avoiding Deception in the Marketplace" Report by ANMC Consumer Liaison Committee, including two case studies of conversion in the U.S., suggestions for consumer education programs a section on metrication in other countries, and a checklist of recommendations to all groups involved in planning for and implementing metrication. Single copies available free of charge--send a 13¢ stamp and a mailing label. Additional copies available at quantity rates:

less than 10	$0.40
10-49	$0.35
50-99	$0.30
100-499	$0.25

2. Barron's Educational Series, Inc.
113 Crossways Park Drive
Woodbury, New York 11797

"The Metric Book...of Amusing Things To Do" (by Elisabeth Hallamore) An unusual activity, puzzle, and game book for people learning the metric system. (96 pp, $1.95)

3. Creative Productions, Inc.
P. O. Box 27433
St. Louis, Missouri 63141

"The Metrics Are Coming"
Nontechnical booklet intended as a learning (and reference) vehicle for consumers. Booklet was reviewed for technical accuracy of metric use by the U.S. Department of Commerce/National Bureau of Standards. Copies available at the following rates:

up to 500 copies	$0.55
500-999 copies	$0.50
1,000-1,499 copies	$0.45
1,500-1,999 copies	$0.40

4. Educational Pioneers, Inc.
418 Poole Road
Westminster, Maryland 21157

"Meters" (Book 1); "Liters (Book 2); "Grams" (Book 3)
Three pocketsized booklets directed primarily to parents. Each booklet contains a self-test at the end. Package retails for $1.49, but can be purchased in bulk quantities from the publishers at $0.70 per package.

5. Instructional Materials Development Center
2720 South Main Street
Winston-Salem, North Carolina 27107

"A Parents' Guide to Homework"
Booklet for parents of children introduced to metrics in school. Introduces metric terms and provides instructions on maing a few metric measuring tools. (15 pp., $0.50)

Business and Professional

1. Burgundy Press
P. O. Box 313
Southampton, Pennsylvania 18966

"Guidelines for Industrial Metrication" (by Prof. Harold W. Byerly, Pennsylvania State University)
Outgrowth of material prepared for presentation at a series of Metric Workshops for Industry. Booklet describes the primary factors involved in establishing and implementing a metric conversion program in industrial companies. (29 pp., $2.00)

2. International Informational Services
P. O. Box 292
Gorham, Maine 04038

"Medicine and Metrication" (by Howard Faulkner, University of Maine)
This publication was prepared to assist physicians' offices, hospitals, clinics, laboratories, and medical educational programs in the adoption of SI. Booklet gives common SI units that have application in medicine and related sciences, temperature guidelines, SI style practices, a discussion of SI in clinical chemistry, and common lab test references. Copies available at the following rates:

less than 10	$1.75
10-49	$1.55
50-99	$1.32
100-499	$1.15

(36 pp.)

"Metric Style SI Manual - For Written and Computer Usage" (edited by Howard Faulkner, University of Maine)
Resource for all writing applications of SI measurement units, prefixes, and symbols, including style rules for data processing applications among processing systems having a limited alphabet or symbols and a chart showing measurement units with SI and computer symbols. Copies available at the following rates:

less than 10	$1.25
10-49	$1.00
50-99	$0.99
100-499	$0.89

3. 3M Company, Visual Products Division
3M Center, Bldg. 220-10W
St. Paul, Minnesota 55101

"Sequence of Metrication Tasks"
Wall chart which outlines sequence of metric conversion tasks for corporations. The phases of investigation, planning, and implementation are applied to the departments of management, purchasing, engineering/design, manufacturing, marketing and advertising, and word/order processing. ($2.50)

4. U. S. Metric Association (USMA)
Sugarloaf Star Route
Boulder, Colorado 80302

"Metric Handbook for Hospitals" (revised Second Edition)
A guide for using SI metric units in hospital practice along with recommendations for undertaking a metric implementation program. Copies are available at the following rates:

single copy	$1.00
2-9 copies	$0.60
10-99 copies	$0.45
100-or more	$0.40

(14 pp.)

"Metric Units of Measure and Style Guide" (revised Eleventh Edition)
An editorial guide to correct SI metric practice. Copies are available at the following rates:

single copy	$1.00
2-9 copies	$0.60
10-99 copies	$0.40
100-or more	$0.35

Produced under Grant #G007702036 from the U.S. Office of Education, DHEW

The following metric materials are available at no cost to teachers upon request from the respective suppliers. These materials have been screened by the METS Program for general acceptability, but have not been reviewed in depth. Accordingly, some errors or inconsistencies may have slipped past us. Several items listed below use the "er" spelling, but it was decided to include them in the list because of their overall value. Materials with serious faults, in our judgment, have not been included.

We hope that these materials will continue to be available and that they will be useful to you. As we learn of other free metric materials of value, we will keep you informed.

1. Department of the U.S. Army
   Distribution Division
   Fort Sheridan, Illinois 60037

   "Modernized Metric System" poster (1973)
   Developed by the National Bureau of Standards - suitable for secondary students and adults.

2. Educulture, Inc.
   3184 "J" Airway Avenue
   Costa Mesa, California 92626

   "Think Metric U.S.A. - An Audio-Tutorial Mini Course," 1975
   A sample audio-cassette of selected excerpts and a student instructional manual from their audio-tutorial learning program, "Think Metric U.S.A." - suitable for elementary and secondary students and adults.

3. Federal Reserve Bank of Minneapolis
   Minneapolis, Minnesota 55480

   "The United States and the Metric System,"
   Ninth District Exponent Number 10, 1976
   40-page booklet updates the history of metrication through 1975, reviews the pros and cons of metrication, and offers an examination of some of the problems associated with conversion along with means of relieving those problems - suitable for adult and possibly high school levels. Classroom copies available.

4. Field Enterprises Educational Corporation
   Merchandise Mart Plaza
   Chicago, Illinois 60654

   "Metric System/Weights and Measures:
   Reprint from The World Book Encyclopedia, 1976 sections on the "Metric System" and "Weights and Measures" - 13 pages.
   (Unfortunately, the articles contain many conversion tables.)

"The Common Sense Metric Manual."
can be obtained, free of charge, by contacting:

Lydia Wells Sledge, Mathematics Consultant
Division of Program Development-Bureau of Instruction
Kentucky Department of Education
1327 Capital Plaza Tower
Frankfort, KY 40601 (Phone: 502-564-5587)

(limited to one per person)

5. JC Penney Educational Materials - write your local store

"Insights Into Consumerism: Moving Toward Metric," 1974
Packet includes:
  (a) Five pamphlets discussing our changeover to metric activities and duplicating or overhead projector materials
  (b) Poster - "The Language of Metric"
  (c) Script for radio/TV - "Moving Toward Metric"

(Because the materials were produced in 1974, information on legislation is not up-to-date. Material discusses only liquid volume and assumes that volume is only measured in litres.)

"The Metric Song" - filmstrip available on loan for one week.

6. LaPine Scientific Company
Department 05
6001 South Knox Avenue
Chicago, Illinois 60629

Plastic metric ruler

"Metric Handbook," a publication which contains activities and exercises for the classroom.
(We were not able to review this handbook.)

7. National Bureau of Standards
Metric Information Office
Washington, D. C. 20234

"Some References on Metric Information"
Metric packet includes:
  (a) NBS Special Publication 389, "Some References on Metric Information," 1975
  (b) "Brief History of Measurement Systems," 1975 - with a chart of the modernized metric system on the back
  (c) Poster - "All You Will Need to Know About Metric," 1974
  (d) Pocket-sized, plastic metric conversion card
  (e) Chart on metric conversion factors, 1976
  (f) Plastic centimetre/inch ruler
  (g) "Household Weights and Measures," 1975 - includes information on using the metric system in the kitchen
  (h) "America Joins a Metric World," 1976 - reprint from Dimensions/NBS

8. Ohaus Scale Corporation
29 Hanover Road
Florham Park, New Jersey 07932

"Recommended Lists of Equipment for Teaching the Metric System of Measurement," 1976
Booklet designed to help you select and use metric tools in grades K-8. Lists of equipment are arranged grade-by-grade for schools of various sizes and budgets.

9. National Council of Teachers of Mathematics
1906 Association Drive
Reston, Virginia 22091

"Free Materials for the Teaching of Mathematics," August 1976
NCTM update and guide to suppliers of math materials.

Supplement

1. D. C. Heath and Company
School Division
125 Spring Street
Lexington, Massachusetts 02173

"In-Service Manual of Metric Measurement Activities" (#01096-0)
Contains activities which introduce some of the more commonly used metric units. (14 pp.)

"Teaching Metric Measurement" (#00139)
Contains sample exercises appropriate for grades 1-6 from the Heath Elementary Mathematics Program along with instructions for the teacher. (14 pp.)

2. Department of Communications
Science Research Associates, Inc.
259 East Erie Street
Chicago, Illinois 60611

Community Relations Package is available to schools free of charge. The package contains suggested activities for a Think Metric festival, a historical vignette, and suggested news releases.

3. Department of the Treasury
Bureau of Alcohol, Tobacco, and Firearms
Washington, D. C. 20226

Two complimentary wallcharts:

"How do the new distilled spirits metric sizes compare with the current U. S. sizes?" (ATF P 5100.6)

"The metric system for wines" (ATF P 5100.7)

4. Lily Creative Services Department
P. O. Box 1035
Toledo, Ohio 43666

"Metricups"
Free samples of colorful cups with characters asking a metric question on each cup that requires a measurement activity to obtain the answer.

5. Metric Information
P. O. Box 111
Washington, D. C. 20044

"Take 10 America"
Informative poster which includes metric prefixes chart, metric exercises for the classroom, and an approximate conversion chart.

6. Mr. Wayne R. Scott, Mathematics Specialist
Michigan Department of Education
P. O. Box 30008
Lansing, Michigan 48909

"Teacher Resource Guide for Metric Education"
An informative guide for elementary and secondary teachers which provides the basics of the metric system, advice on choosing instructional material and equipment, instructions for assembling metric teaching materials, and suggested classroom activities for grades K-6. (46 pp.)

7. Division of Secondary Education
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216

"Metric Education Plan for Virginia, 1977"
State Plan includes organizational structure for metric education in Virginia, guidelines for administrative planning, the responsibilities of each instructional program, suggestions for a metric olympics, and sample attitudinal and cognitive test items. Supply is limited. (53 pp.)

10. Prentice-Hall Media, Inc.
150 White Plains Road
Tarrytown, New York 10591

"When You Can't Give'em An Inch - Metrics Made Easy"
Literature about their metric program which contains a centimetre ruler calibrated in 10 cm units - suitable for bulletin board display.

11. Sears, Roebuck and Company
Consumer Information Service
D/703, Sears Tower
Chicago, Illinois 60684

"An Educator's Guide to Teaching Metrication," 1974
This guide was designed to help secondary teachers incorporate the metric system into different subject areas.

Produced under Grant #G007702036 from the U.S. Office of Education, DHEW

Making Metric Equipment

Make Your Own Metric Measuring Aids , Susan G. Hanson, 1977, 38 pp.
$3.50.
METS PROGRAM, P.O. Box 1113, Palo Alto, CA 94302

A "How To" book containing instructions and illustrations for making metric tools and measuring devices that teachers can construct and many students as well. Includes tools for measuring length and area, volume and capacity, and mass.

Examples of three tools which can be constructed from readily available materials are shown on the following pages. Samples can be found on exhibit at this workshop.

An exhibit of "homemade" metric equipment is on display at this workshop.

FOLDING METRESTICKS*

A letter-sized manila file folder is 30 cm long. It is possible to make three folding metre sticks from one folder.

MATERIALS AND TOOLS

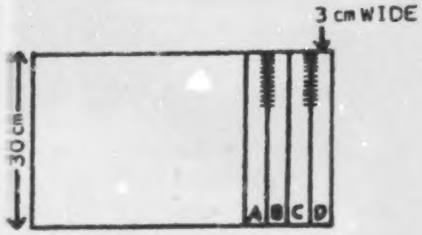
Manila folder (letter size) or oaktag (30 cm x 44 cm)

Paper fasteners

Scissors

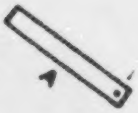
Metric ruler

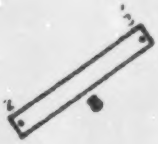
Paper punch

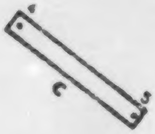


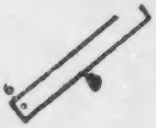
PROCEDURE

1. On the folder mark off 4 strips, each 3 cm wide. Mark off cm units on the length of each of the strips. Cut off the 4 strips.
2. Cut one strip A to a length of 25 cm; punch a hole in the center of the strip. Center of the hole should be 2 cm from end.
3. Cut remaining three strips to a length of 29 cm; on strips B and C punch two holes, one at each end, 2 cm from the end; on strip D punch one hole in the center of the strip 2 cm from the end.



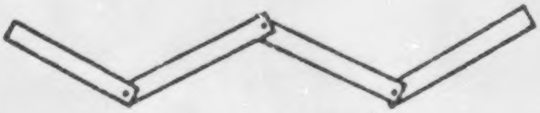






4. Assemble the strips as follows:
   - A. Put strip A on top of strip B, matching holes 1 and 2; fasten with paper fastener.
   - B. Put strip B on top of strip C, matching holes 3 and 4; fasten with paper fastener.
   - C. Put strip C on top of strip D, matching holes 5 and 6; fasten with paper fastener.

   Assembled strips should have a length of 1 m or 100 cm.



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*Reprinted with permission from Brooklyn College, USOE Metric Education Project, Brooklyn, New York.

ORIGAMI CUBIC DECIMETER*

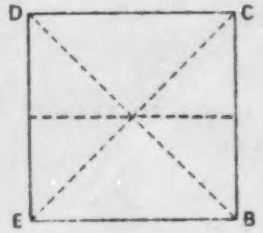
The finished cube will be 10 centimeters on a side and will hold 1 liter of air.

MATERIALS

"Sheets of newsprint that form a square 40 centimeters on a side"

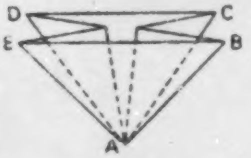
PROCEDURE

"1. Fold the paper from corner to corner" and in half. Crease, then open.



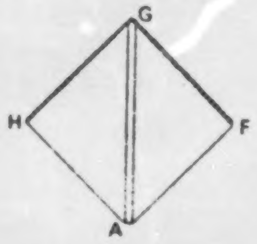
1

"2. Fold the sides in to form a triangle."



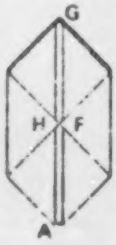
2

"3. Fold points E and B down to point A. Turn it over and fold C and D down to point A. Keep point A pointing downward."



3

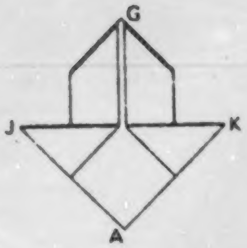
"4. Corners H and F are now double and A is loose. Fold H and F to meet in the center. Turn it over and do the same for the corners on the back."



4

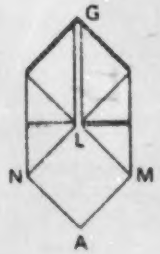
"5. Fold the loose ends out to form **Diagram 5**. Turn it over and do the same on the back."

5



"6. Fold J and K over the middle to form right triangles. Turn it over and do the same for the back."

6



"7. Tuck the small right triangles made in number 6 into the pockets along LM and LN. Do not tuck them under LM and LN. Turn the model over and do the same on the back."

"8. Open the hole at G slightly with a pencil point. Blow hard into this hole, forming and creasing the cube as you blow."

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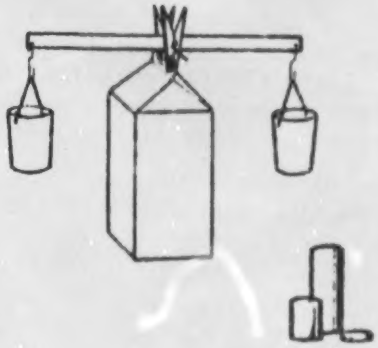
* Reproduced with permission from Kurtz, V. Ray: Teaching Metric Awareness, 1976; copyrighted by the C. V. Mosby Co., St. Louis, Mo.; horizontal fold line added to Diagram 1.

PAN BALANCE 3*

MATERIALS AND TOOLS

- Tall empty juice can, coffee can, or milk carton
- Two spring-type clothespins
- Stiff wire (a large paper clip or coat hanger wire may be used)
- Rubber eraser or clay
- Wooden ruler
- Plastic margarine tubs or paper cups
- String
- Paper clips
- Tape
- Drill
- Wire cutter



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*From "Metric Survival Kit In-Service Guide," 1975. Adapted with permission from the publisher, Enrich, Inc.

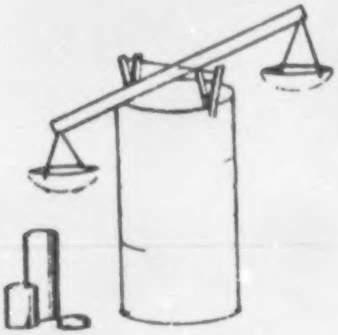
PROCEDURE

For the base:

1. Clip 2 spring-type clothespins to the top of a tall empty juice can, coffee can, or milk carton.
2. If you are using the cylindrical base, split the top part on one side of each clothespin. This side should face the inside of the can. Cut a piece of stiff wire the right length to be held between the clothespins. The split will hold the wire, and the ends of the wire will be against the other part of the clothespin, so no one can get scratched. If you are using the carton, put the wire through the springs of the clothespins. Cover the ends of the wire by sticking each into a piece of rubber eraser or clay.

For the balance:

3. Use a wooden ruler or other similar stick. Any length from 25 cm up will do. The longer the rod, the more sensitive your balance will be. A 30 to 50 cm length works very well.
4. Carefully mark and drill a hole equidistant from both ends. Check that your ruler balances by suspending it from the stiff wire. If the balance is slightly off, stick a small piece of tape to the lighter end.
5. Drill holes close to the ends equidistant from each end, from which to hang your pans. Empty plastic margarine tubs or paper cups may be used for the pans. Make sure your pans are identical, and use equal lengths of string and two paper clips of the same size to suspend the pans.
6. Check the balance of your scale again, with the pans in place, and use a piece of tape on the lighter pan to adjust the balance, if necessary.



Teacher In-Service Workshop Guides

All Together Now-Teach Metrics, Winston Salem/Forsyth Education Project

in-service and classroom activities.

Instructional Materials Development Center cost: $2.00
2720 S. Main St.
Winston Salem, N.C. 27107

Education and Metrics, 3-M Company

complete metric instructional unit of 200 visual originals, teacher in-service section, student instruction section.

Visual Products Division cost: $98.00
3 M Company
3 M Center
St. Paul, Minn 55101

Inservice Guide for Teaching Measurement (K-8): The SI Metric System
California State Department of Education

curricular strategies and classroom activities

California State Department of Education cost: $1.25
Publication Order Section
P.O. Box 271 order pub. #SM 4017
Sacramento, CA 95802

Inservice Guide for Teaching Metric Measurement, E.L. Edwards, Jr.

guidelines for inservice leaders, SI standards, suggested instructional practices.

Harry L Smith cost: $.50
State Department of Education
Ninth Street Office Building
Richmond, VA 23216

Let's Go Metric, Georgia Metropolitan Cooperative Educational Service Agency

teacher training guide with hands-on activities.

Georgia Metropolitan Cooperative Educational Service Agency
2268 Adams Drive, NW.
Atlanta, GA 30318 Attn. Harriet Harman, Publications

cost: $2.50

Measuring in Metric: A Teacher's Workshop Manual for Individualized Instruction, Juanita S. Sorenson.

manual for acquainting elementary teachers with the metric system.

University of Wisconsin-Eau Claire cost: ?
Eau Claire, Wisconsin

Metrics Made Easy, Ocean View School District.

teacher/community inservice program ($2.23), also teacher resource guide , activity sheets, and student assessment available for primary intermediate, and junior high ($8.92 per level), game and task card ideas ($15.90)

Metrics Made Easy cost: see above
Ocean View School District
7972 Warner Ave.
Huntington Beach, CA 92647

Metric Workshop for Students, Parents, and Teachers, Norman LaPalme.

Franklin Publishing Co., Inc. cost: $5.00
Palisades, NJ 07024

What You Always Wanted To Know About the Metric System But Were Afraid To Ask, College of Continuing Education, University of Southern California.

School of Education cost: ?
College of Education
University of Southern California
Los Angeles, CA

TEXTBOOKS

To our knowledge there exists no comprehensive summary and evaluation of textbook materials which include metric measurement units. We encourage you to make your own evaluation by doing the following:

A. Reading reviews of textbook and other metric materials such as those published in the Arithmetic Teacher and School Science and Mathematics. Sample reviews and the address of the subscription department for these journals is included.

B. Consult the "Metric Materials" section of the Arithmetic Teacher which appears monthly in "Reviewing and Viewing."

C. Write to publishers requesting to review textbooks. Most publishing houses are including metrics in their latest publications. A list of publishers is included in the Sources of Metric Materials section of this Guide.

D. Evaluate published materials using criteria such as those proposed in "Guidelines for Evaluation of Published Metric Materials," Cecil Trueblood and Michael Szabo, Arithmetic Teacher February, 1978, pp. 46-50.

Reviewing and Viewing

New Books for Teachers

Elementary Mathematics. *Donald F. Devine and Jerome E. Kaufman. 1977. xiii + 525 pp. $13.95. John Wiley & Sons, 605 Third Avenue, New York, NY 10016.*

This book is designed for mathematics content courses for preservice and inservice elementary school teachers. The topics covered include sets, numeration systems, whole numbers, integers, rational numbers, real numbers, geometry, measurement, probability, and statistics. Even though most of the topics covered are typical of those found in contemporary texts, the authors' treatment reflects changes in emphases that many educators are currently recommending. For example –

New Books for Pupils

- set concepts are not developed as terminal goals but rather as aids for motivating number ideas and operations;
- basic logic concepts are integrated, as needed, with other topics that are more directly related to the elementary school curriculum;
- intuitive arguments, rather than rigorous proofs, are often provided to justify mathematical concepts and methods;
- exercises that encourage the use of the minicalculator and call attention to its educational benefits are provided;
- metric units receive a great deal of attention in the development of measurement concepts;
- basic geometry concepts are explored in terms of transformations and coordinate geometry concepts, as well as point-set ideas.

Throughout the text the authors suggest methods for presenting mathematical concepts in the classroom. In most cases, the suggestions are satisfactory; however, in some cases their appropriateness could be questioned. For example, on page 30 the authors give the following suggestion for illustrating that 3 times 4 is 12.

"Children at the first-grade level might use sets of objects or tally marks, such as (||||) ∪ (||||) ∪ (||||)."

January 1978 33

Arithmetic Teacher $7.00 per year

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091

School Science and Mathematics $9.00 per year

School Science and Mathematics Assn., Inc.
P.O. Box 1614
Indiana University of Pennsylvania
Indiana, PA 15701

(In addition to book reviews, this journal regularly features a "Measurement Corner.")

Book Vignettes

SCIENCE RESEARCH ASSOCIATES *An Everyday Guide to the Metric System*. Chicago: Science Research Associates, Inc., 1976. Pp. 63.

With the United States being about the last nation to go metric, there is obviously a surge of publications to enlighten the public about the transition and incidently to "make a few bucks." This metric manual, developed jointly by Science Research Associates and the Associated Press, more or less in newspaper style, will be the basis for a 10-article series that will be distributed to AP Newspapers in January 1977.

After three chapters dealing with the background of the metric system and certain political implications. The uses of the system are explained. The explanations describe various units of length, area, volume, mass, temperature, and derived units. These are followed by implications for teaching the metric system and some possible impacts of the conversion. A number of teaching activities are included in chapters in which the units in the system are explained.

The material is succinct and easy to read.

Measurement Corner

Edited By
Robert M. Todd
and
Thomas G. Teates

Virginia Polytechnic Institute
and State University
Blacksburg, Virginia 24061

This feature of *School Science and Mathematics* is designed to provide readers with:

1. A review of fundamental measurement concepts;
2. Examples of activities which clearly illustrate concepts;
3. A forum for those who wish to bring measurement concepts and activities to the attention of other readers.

The editors of "Measurement Corner" are anxious to serve their readers by making the feature useful and interesting. Readers are invited to contribute papers for consideration for presentation in "Measurement Corner." They should be limited to 600-1000 words and should meet the usual format requirements for articles submitted to *School Science and Mathematics*. Please send proposed papers, suggestions or comments about the Corner's articles to either of the Corner's editors, College of Education, VPI & SU, Blacksburg, Virginia 24061.

'etric Materials

ited by Joan Kirkpatrick
iversity of Alberta
lmonton, Alberta

Code Used in Reviews of Metric Materials

ults — S For students
achers — * Good
adership personnel — ? Questionable

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at about Metrics? *Louis E. Barbrow*

75, 16 pp., $0.35. National Bureau of Stan- ds, Washington, D.C. 20234. For sale by the erintendent of Documents, U.S. Government ting Office, Washington, D.C. 20402.

A, *

short booklet is addressed to the general ence and is designed to help the reader be- familiar with the metric system, partic- as it applies to everyday life. Simple and ve reasons for the increased use of the met- tem are presented, followed by a list of the d their prefixes. Comparisons of the ma- ts in both systems are effectively illustrated everyday quantities and sizes, and conve- physical referents are given for the most mmonly used metric units. Three "everyday blems" are solved using units from both sys- but there is no direct conversion from one m to the other. Short explanations are of- d regarding what the introduction of the met- ystem will mean in the marketplace, in the e, and to the worker. In general—a simple, cent, and effective presentation is made in this klet, which schools or teachers could recom- nd for parental reading.—*J. A.*

ing Metric. *Stewart M. Brooks. 1976. 123*

$6.95 cloth. A. S. Barnes & Company, Box 1, Cranbury, NJ 08512.

A, T, L, *

Book is organized into three parts. The first deals with the history of measurement from ient times to the present, where the author usses the development of the British imperial m, the U.S. customary system, and SI. The d part of the book is concerned with SI. section is devoted to each of the seven base of SI (second, meter, kilogram, mole, kel- ndela, and ampere), and the supple- ary units (radian and steradian) are ex- ed in a further section. The author shows these SI units have evolved, and explains n with a considerable amount of technical il. He also refers to the derived SI units, and points out the many relationships existing een various units. Tables and conversions ven in the third part of the book. The units, ols, and values for both the U.S. customary em and the apothecaries' system are pre- ed. The author then lists the SI base, supple- ntary, and derived units with their corre- nding symbols. This section is followed by handy lists of conversion factors for chang- from U.S. customary to SI and vice versa. In first list, factors are approximate, and in the ond they are accurate to six significant figures. The book concludes with a comprehensive glossary of terms. Teachers, from elementary school through college, would find that this book provides very useful background for understanding SI. Although the author's treatment is somewhat technical, it is well organized and presented in an interesting style. Perhaps the author could have given more attention to the everyday applications of SI.—*Jack Bana, Mount Lawley College, Perth, Australia.*

Everyday Guide to the Metric System.

Science Research Associates. 1976, 64 pp., $1.25. Science Research Associates, 259 East Erie Street, Chicago, IL 60611.

A, T, S, *

This book is everyman's everyday guide to the metric system. In fact, it is so everyday that it reads like a newspaper, although the information it provides seems to be more accurate as well as more trustworthy. The book is written for everyone—the layman, students, and teachers as well. The book assumes that you cannot learn metric by simply reading a book or by making a thousand conversions; rather, experience is the key. Thus a cut-out meterstick is supplied and the reader is encouraged to use it in seventeen tasks ranging from body measurements to map reading. A similar experience-oriented approach is taken to area, volume, mass, temperature, and some derived units. Accompanying each set of tasks is a page or two of background information written in newspaper style. The book also recommends the experience approach to the teacher and goes so far as to provide an appendix of suggested activities for students, complete with cutouts and lists of material.

A plus factor for this pamphlet is its readability—it is written to be as interesting as newspaper stories and at the same time to retain accuracy and perspective. Interesting, also, is the chapter on the fact that many aspects of our everyday life will not be perceptibly affected by the switch to SI. Historical and political background of SI and the movement of the United States toward metric, along with an appendix of terms and symbols in SI, round out the booklet. Its readability, accuracy, and experience-oriented approach make this booklet highly attractive for teachers.—*D. Sawada, University of Alberta.*

The Metric Village Measuring Kit, Length.

Joseph Cech, consultant. Multimedia kit including 1 sound filmstrip with cassette, 24 activity cards, 4 worksheets, 1 flexible meterstick, 6 centimeter rulers, 2 metric tape measures, and 1 teacher's guide. $59.

The Metric Village Measuring Kit, Liquid Volume.

Joseph Cech, consultant. Multimedia kit including 1 sound filmstrip with cassette, 18 activity cards, 4 worksheets, 1 set of 3 plastic beakers with milliliter calibrations, and 1 teacher's guide. $59.

The Metric Village Measuring Kit, Weight.

Joseph Cech, consultant. Multimedia kit including 1 sound filmstrip with cassette, 18 activity cards, 4 worksheets, 1 balance scale, 32 assorted gram weights, and 1 teacher's guide.

Coronet, 65 East South Water Street, Chicago, IL 60601.

T, L, S, *

Each kit features a sound filmstrip with cassette. In the *length* kit, centimeter people find the length of a baseball bat while meter people find the length of a highway. In the *volume* kit, Mike the Measuring Cup measures out liquid ingredients for a bake sale. In the *weight* kit, the different types of scales—office letter scales, vegetable scales for a grocery store, and so on—are personified and the scales have a Halloween party. In each story, Mischief the Elf creates some kind of trouble that is overcome by the metric instruments.

A set of plastic-laminated activity cards in each kit provides illustrated step-by-step directions for some excellent manipulative experiences. Many of the activities culminate in the preparation of charts. Some of the activities encourage children to estimate before they measure, a most important step.

Each kit contains several durable, plastic, measuring devices such as a flexible meter stick, measuring cups, and a pan-balance scale. Illustrated worksheets in the form of spirit masters can be used to provide additional pencil-and-paper activity, or as a means for assessing achievement of the objectives that are covered by each kit. The entire package for each kit is correlated in a four-page teacher's guide. The "think metric, immersion" approach is featured throughout. The kits would be a most useful addition to the set of metric resources in any elementary school.—*K. Allen Neufeld, University of Alberta.*

Metric Guide for Educational Materials.

Educational Materials Sector Committee of the American National Metric Council. 1977, 22 pp., $1.25. American National Metric Council, 1625 Massachusetts Ave., N.W., Washington, D.C. 20036.

T, L, *

This booklet was written as a handbook for teachers, writers, and publishers. The preface states that the recommendations made "are intended to serve as a guide to accepted metric practice, with special consideration given to the preparation and use of elementary and secondary educational materials." The guide lists metric units and symbols and makes specific recommendations regarding spelling, punctuation and spacing, preferred prefixes, and pronunciation. The National Council of Teachers of Mathematics is following the guidelines recommended in this booklet in its publications.—*J. K.*

Recommendations for Evaluating Published Metric Materials

(1) The metric system should be taught as the primary measurement system.

(2) Metric instructional materials should use only metric names and symbols.

(3) A metric curriculum unit or program should give a high degree of emphasis to hands-on metric estimation and measurement activities.

(4) More than 50% of the per-pupil cost should be spent on supplying students with measurement instruments and written materials that will guide hands-on estimation and measurement activities.

(5) A metric curriculum or program should sequence the content and activities sho that they match the learner's stage of development. Instructional activities using a variety of nonstandard units should precede standard measures. Metric units should be introduced after the children understand the nature of the attributes to be measured.

(6) Teaching the metric system should not be limited to just science and mathematics activities. Instead, metric education should be integrated into all subject areas where appoopriate, with each subject emphasizing the metric units most used in that subject area.

(7) Teachers should be provided with inservice training and teaching guides that focus on the metric knowledge, measurement, and estimation skills they will be required to teach. Hence, inservice programs should be planned based on needs assessment data that includes a teacher self-inventory.

"Guidelines for Evaluation of Published Metric Materials", Cecil Trueblood and Michael Szabo, Arithmetic Teacher, February, 1978, pp. 46-50.

BOOKS FOR METRIC LEADERS

Adams, Herbert F.R. SI Metric Units: An Introduction. New York: McGraw Hill, 1974. $3.95 pap.

Branley, Franklyn. Think Metric. New York: Crowell, 1972. $4.50.

Cortese, Carole E. Metric Measurement. New York: American Book, 1970.

DeSimone, D.W. A Metric America: A Decision Whose Time Has Come. National Bureau of Standards, 1971. $2.25.

Donovan, Frank. Let's Go Metric. New York: Weybright and Talley, 1974. $5.95.

Donovan, Frank. Prepare Now for a Metric Future. New York: Weybright and Talley, 1970.

An Educator's Guide to Teaching Metrication. Chicago: Sears, Roebuck, 1974. Free upon request to Sears Consumer Information Services.

Glaser, Anton. Neater by the Meter: An American Guide to the Metric System. Southampton, PA: A. Glaser, 1974. $6.50. $3.50 pap.

Higgins, Jon L., ed. A Metric Handbook for Teachers. Reston, VA: National Council of Teachers of Mathematics, 1974. $2.40.

Hirsch, S. Carl. Meter Means Measure: The Story of the Metric System. New York: Viking, 1973. $4.95.

Hopkins, Robert A. The International Metric System and How It Works. Tarzana, California: Polymetric, 1973. $12.95.

Izzi, John. Metrication, American Style. Bloomington, Indiana: Phi Delta Kappa Educational Foundation, 1974. $0.50.

Metres, Litres and Grams. Schools Council London: Schools Council Publications, 1971. pp. 40. Distributed in the U.S. by Citation Press.

Metric Editorial Guide. Washington, DC: American National Metric Council, 1974. $1.50.

Metric System Guide Library. 5 v. Neenah, Wisconsin: J.J. Keller, 1974. $395.00 set, $99.00 each volume.

The Metric System, A Teacher Guide (K-9), The International System of Units. 1974, 113 pp., Hawaii District Office, Department of Education, Honolulu, Hawaii 96804.

Metric Supplement to Science and Mathematics. Boulder Co., Metric Association, Inc. 1971. (rev.)

Metrics in the K-8 Curriculum, A Multidisciplinary Guide to Transition. 1976, 120 pp. Winston Salem/Forsyth County, North Carolina Schools.

NBS Guidelines for Use of the Metric System. National Bureau of Standards, LC 1056. 1974.

Page, Chester H. and Vigourerex, Paul (eds.) The International System of Units (SI). National Bureau of Standards, Special Publication 330, 1974. $0.65. (SD Catalog No. C13.10:330/3).

Robinson, Berol D. Education (An Interim Report of the U.S. Metric Study). National Bureau of Standards, Special Publication 345-7. 1971. $1.75.

Ross, Frank, Jr. The Metric System: Measures for All Mankind. il. by Robert Galster. New York: S.G. Phillips, 1974. $8.95.

Science Research Associates. An Everyday Guide to the Metric System. 1976. 63 pp. Associated Press Books, 50 Rockefeller Plaza, New York, NY 10020.

Smart, James R. Metric Math: The Modernized Metric System (SI). Monterey, California: Brooks Cole, 1974. $3.50.

Some References on Metric Information, With Charts on: All You Need to Know About Metric (and) Metric Conversion Factors. National Bureau of Standards, Special Publication 389. 1973. $0.35.

Vickers, J.S. Making the Most of Metrication. New York: Beekman, 1969. $10.95.

Young, Lorelle; Bickfeld, Carole. Hometrics, 1977, 104 pp. Enrich, Inc., Sunnyvale, CA.

Audio Visual Resources

The Adventures of Mr. Windbag...in Metricland. 3 filmstrips with cassettes, color, teacher's guide, student sound sheets, Oak Brook, Illinois: Educational Products, 1974. w/student sound sheets, $75.00; w/o student sound sheets, $45.00. Individual or group program for learning metric length, volume, weight; worksheets and individual sound recordings included.

Discover...Why Metric. 8 mm, color; 16 mm, color. S. Beloit, Illinois: Regal Beloit, 1972. $115/$195. Basic principles of the metric system in cartoon format, illustrated by chief character, "Metric Mike."

Cullible's Travails or How the Meter Met Her Match. 12 mm, 16 mm, rental $15.00, purchase $165.00. Davidson Films, Inc. 3701 Buchanan Street, San Francisco, CA 94123.

International System of Units. 16 mm, color. Seattle, Washington: King Screen, 1970. $250.00. Measuring methodology for length, mass, time and temperature for physical science students.

Introducing the Metric System. 4 filmstrips, 2 records, color. Santa Monica, California: BFA Educational Media, 1973. $48.00. Metric units, relationships, and uses, in measuring length, volume, mass. Activity cards included.

Learning About Metric Measures. 16 mm color. Santa Monica, California: BFA Educational Media, 1970. $215. Introduces basic concepts; emphasizes decimal nature of metric system.

Measurement. 2 filmstrips, color, teacher's guide. Chicago, Illinois: Visual Education. $7.00. Discusses history of measurement, length in the metric system, and the outlook for a metric future.

Measurement Skills: Centimeters and Decimals. Filmstrip with cassette, workbook, etc. Encyclopedia Britanica. $58.75. Individual participation in teacher direction activities and interaction with group in learning basic metrics.

Measuring: A Metric Approach. Multimedia kits. Tarrytown, New York: Schloat. Unit I (Length and Area) $160; Unit II (Volume and Weight) $215; both $355.00. Multimedia kit includes filmstrips and manipulative materials to introduce the metric system as a "first language" of measurement.

Measuring the Metric Way. 2 filmstrips with discs or cassettes, color. New York: Guidance Associates, 1974. w/disc: $22; w/cassette: $24.50.

Meter, Liter and Gram. 16 mm color. Santa Monica, California: BFA Educational Media, 1970. $170. Initial experiences with metric length, capacity, weight. Discussion aids included.

Eye Gate Media. "Learning to Measure in a Metric World", very good, interesting, visually appealing. About non-standards units and then metric units. Grades 1-6 = appropriate level.

Meters, Liters, and Kilograms. 16 mm color. Northfield, Illinois: Metrication Institute of America, 1974. $310. Also available as three separate films: The Meter, $150; The Liter, $90; The Kilogram, $150. Introduces metric measurement through a variety of activities performed by children.

A Metric America. 16 mm, color. Hollywood, California: AIMS, 1973. $215. 8 mm also available. Animated narration showing the need for transition to metric, and its effect.

Metric System. 13 min. black and white, 16 mm. McGraw-Hill.

The Metric System. 44 frames, color, 35 mm. William P. Gottlieb Co.

The Metric System for the Intermediate Grades. Set I, 4 filmstrips with discs or cassettes, color; Set II, 4 filmstrips with discs or cassettes, color. New Rochelle, New York: Pathescope, 1973. Set I (Length, Area, Volume) w/discs, $52; w/casettes, $60; Set II (Capacity, Mass, Metric Relationships) w/discs, $39; w/cassettes, $45. Simplified introduction to the basic metric units and relationships.

The Metric System--The Universal Language of Measurement (revised). 6 filmstrips with cassettes, color. New Rochelle, New York: Pathescope, 1974. $75. Introduces metric length, area, volume, mass and capacity; discusses metric units in the science laboratory.

Metric System Teaching Tapes. 6 cassettes and workbook. New York: Houghton Mifflin, 1973. $36. Introduces basics of metric measurement for everyday use.

The Metrication of America. 4 filmstrips with discs or cassettes, automatic and manual, color. New York: Westinghouse, 1974. $69.50. Sequential series. Cartoon characters show how metric system affects life.

A Metric America. 6 sound filmstrips, color. Hollywood, California: AIMS, 1973. w/discs, $78; w/cassettes, $90. History, length, area, volume, weight, and temperature; with much detail of instruction, errs in placing periods after metric symbols; teacher's guide.

METRICS FOR CAREER EDUCATION. Sound filmstrip series (color): Metrics for Woodworking, Metrics for Home Economics, Metrics for General Metals, Metrics for Machine Shops, Metrics for Drafting, Metrics for Energy and Power. Can a carpenter build a house without 2" x 4"s? Certainly! By using 38 mm x 89 mm's--an exact substitute. Can metal workers cope without fractions and gauge sizes? They can if they orient themselves to the new metric sizes. Six presentations show how metric measurements may soon be used in many areas of work. Each filmstrip defines new terms, illustrates uses of metric tools, and discusses problems in adapting current machinery to the new system. Of high general interest is the "Home

METRICATION AIDS

Activities - Activity Cards

Action Learning Cards - $19.95 - Gamco Industries, Inc., PO Box 1911, Big Spring, Texas 79720
Terminology, Simple measurement, Specific measurement cards. Basic understanding

Armbruster, F. O. Think Metrics: A Basic Guide to the Metric System. San Francisco, Troubadour Press, 1974. $1.50
Lighthearted introduction to SI, with cut-outs and activities

Cherrington, Don. Metric Workshop for Teachers/ Book 6. Stockton, Calif: Willow House, 1974. $2.50
Detailed practicum-type activities for metric planning, teaching & evaluation

Decimeter. Athens, Ohio, Lawhead Press, 1974, $11.00
Game to strengthen or extend knowledge of metric units and prefixes; includes metric questions

Discovering Metrics. $17.50 Selective Educational Equipment, Inc., 3 Bridge St., Newton, Ma. 02195
60 cards intro. measurement and metric system at basic reading level

Fun and Games with Metrics. $5.95, Mafex Media Aids, Inc., 90 Cherry St., Johnstown, Pa. 15902
Reproducible book of games, activities, puzzles and charts, elementary through junior high

Henderson, George L. and Glunn, Lowell D. Let's Play Games in Metrics. Skokie, Ill.: National Textbook, 1974. $6.25.
Games and activities for teaching the metric system.

Henry, Boyd. Teaching the Metric System. Chicago: Weber Costello, 1973. $1.50.
Illustrated guide for teachers, suggested hands-on activities and materials.

Make It in Metric. 1977. Georgia Metropolitan Cooperative Educational Service Agency, 2268 Adams Drive, NW, Atlanta, GA 30318, Attn. Harriet Harman, Publications. $2.50.
Instructions for teacher-made measuring devices and games

Metric Concept Cards. $4.95. Malex Media Aids, Inc., 90 Cheery St., Johnstown, Pa 15902.
Reusable cards developing introduced metric concepts, individual activity

Metric Factory. $3.25. The Math Group, Inc., 396 East 79th St., Minneapolis, MN 55420
Grades 4-9, 25 problem and answer cards applying metric concepts to practical situations

Metric Ladder Race. Oviedo, Fla.: Kent Educational, 1974. $7.95.
Game for learning metric prefixes and their meanings.

Metric Mancovers. $5.00. Activity Resources, Inc., PO Box 4875, Hayward, OH 94540
Big muscle measurement activities involving the child and his environment

Metrics in the K-8 Curriculum - A Multidisciplinary Guide to Transition. 1976. $4.00, Winston-Salem/Forseth County Schools Metric Education Project, Instructional Materials Development Center, 2720 South Main St., Winston-Salem, NC 27107.
Objectives matched to activities

Modern Metric Math. $3.50. West-East Bridge, Unlimited. PO Box 1402, Scottsdale, Ariz. 85252.
Consumable math workbook suitable for K-primary classes

Project Metric Materials. Wayne-Westland Community Schools, Project Metric, 646 N. Wayne Rd. Westland, MI 48185.
includes elementary handbook, activities, book, assessment program, games and activities, community presentation, inservice guide, primary measurement kit, Olympimetrics, measurement of your future, parent workshop guide, time to get Cookin With Metric, Home Economics - Junior High, Industrial Arts Junior High

Milber, Mary and Richardson, Toni. Merry Metric Cookbook. Hayward, Calif.: Activity Resources, 1974. $3.00.
Compendium of cooking-in-metric recipes for elementary pupils.

Richardson, Toni. Making Metric Maneuvers. Hayward, Calif.: Activity Resources, 1974. $5.00.
Games and activities involving physical movements.

Trueblood, Cecil R. Metric Measurement: Activities and Bulletin Boards. Dansville, N.Y.: Instructor, 1973. $1.50.
Lesson and bulletin board ideas on length, area, weight, and volume; spells deka with "c" and uses dk symbol.

Charts and Posters

Beginner's Metric System. $4.75. Milton Bradley Co., Educational Division, Springfield, Ma. 01101.
6 full color story poster cards

Classroom Metric Lines (Posters). Instructor Curriculum Materials. The Instructor Publications, Inc., Dansville, N.Y. 14437.

Lollipop Tree Chart. Ideal School Supple Co. 11000 Lavergne Ave., Oaklawn, Ill.: 60453.
Measuring tree for recording heights up to 153 cm.

Metric Posters. $5.75. (set of 4) Creative Publications, 3977 E. Bayshore Rd., PO Box 10328, Palo Alto, CA 94303.
Imaginative graphics, basic metric concepts, colorful.

Metric Posters. $5.75. (set of 6), National Micrographics Assoc., Suite 1101, 8728 Colesville Rd., Silver Spring, Md. 20910.
Metric basics, Humorous

Metrication Posters. National Microfilm Assoc. Curriculum Materials. Suite 1101, 8728 Colesville,Rd., Silver Spring, Md 20910

Metrication Posters. Polymetric Services, 4600 Brewster Drive, Tarzana, Ca 91356.

Modernized Metric Systems Wall Chart. National Bureau of Standards Special Publication 304. SD Catalog No. C 13. 10:304. 55¢.

Duplicating Masters

Going Metric. Adison-Wesley Publishing Co., 2725 Sand Hill Rd., Menlo Park, Ca 94025
Activity worksheet masters for grades 1-6 with teacher's guide.

Happy Metrics I & II. $16.50 ea. Scott Resources, Inc., 1900 E. Lincoln, Box 2121, Fort Colins, Colo 80522
Reproducible resource book and equipment kit, primary and intermediate teachers instructions, activities, materials for constructing measurement devices.

Metric Skills. Silver Burdett Division General Learning Corporation, 250 James St., Morristown, NJ 07910
Activities and spirit masters for grades 1-8.

Everyday Use

Come into the Metric Kitchen. 1975, 8 pp. Canada Dept. of Agriculture.
How the metric system will affect kitchen measures.

Consumer Metrics. 1975. 34 pp. Metric-systems, 1340 Falmingo Place, PO Box 326, El Cajun, CA 92022.
Basic guide to consumer metrics.

McCall's Guide to Carefree Sewing, 1973. McCall Pattern Co., 230 Park Ave., New York, NY 10017
Figure types and sizes in metrics, plus exercises

The Metric System Day to Day, 1977. 15pp. American National Metric Council.
Consumer booklet on basics for everyday use.

Journal Articles - Activity Oriented

Beckmann, Sue., Hunt, John D. Metric Mapping, Science Activities, v11, n5, pp. 30-31, Nov/Dec 74. EJ 109 849

Bolster, L. Carey. Activities: Centimeter and Millimeter Measurements, Mathematics Teacher v67 n7, pp. 623-627, Nov 74 EJ 106 446.

Bruni, James V., Silverman, Helene J. Let's Do It! Organizaing a Metric Center in your Classroom. Arithmetic Teacher v23 n2, pp. 80-87, Feb 76 EJ 133 397.

Burton, Grace M. Activities, Elementary, pp. 201-207. Jan 76 EJ 134 897

Freeman, William W. K. Think Metric About Weather. Arithmetic Teacher, v22, n5, pp 378-381. May 75 EJ 119 964

Galindez, Peter. Rocketing into the Metric System, Science Activities, pp34-37, Feb 74. EJ 095 231

Galindez, Peter. Experiences for Metric Missionaries, Arithmetic Teacher v20, n4, pp. 269-273, Apr 73. EJ 074 892

Galindez, Peter. The "WHATSIT," A LowOCost Fun Lab in Metrics, Science Activities, v11, n5, pp. 12-14, Nov/Dec 74 EJ 109 845

Hawkins, Vincent J. Construction of the Centimeter Using a Straight Edge, Compass and 1" Length. School Science and Mathematics, v74, no 8, pp. 718-9, Dec 74 EJ 111 542

Iona, Mario. Making Comparisons of Rulings for Metric Measuring Devices. Science and Children, v12, n6, pp. 20. Mar 75. EJ 116 579

Knapp, John. A Pocket Mini-Balance for Pennies. Science and Children, v12, n4, pp20-21, Jan 75. EJ 111 560.

Moser, Doris B. A Laboratory Approach to the Metric System, Learning Resources, v2, n1, pp 6-8, Feb 75. EJ 116 318

Rusnock, Michael A. On Your Mark, Get Set - For a Metric Olympics, Teacher, v92, n9, pp 88-9, May/June 75. EJ 120 365

Schultz, Klaus. Do-It-Yourself Metrication. Science and Children, v12, N6, pp 18-19. Mar 75. EJ 116 578

Stronck, David R., Turner, Linda. Making Measurements and Metric Units, Science and Children, v12, n6, pp 21-22, Mar 75. EJ 116 580

Stuardt, Kristine. Metric Made Fun: An Individualized Approach. Science and Children, v14, n5, pp. 11-13, Feb 77.

Todd, Robert M., Todd, Jeanne M. Teach Something More Than Conversion, Science Activities, v12, n6, pp. 24-25, Nov/Dec 75 EJ 133 220

Trueblood, Cecil,; Szabo, Michael. Procedures for Designing Your Own Metric Games for Pupil Involvement, Arithmetic Teacher, v21, n6, pp. 404-408, May 75 EJ 096 921.

Zimmerman, Marianna. Let's Make Metric Ice Cream. Science and Children, v12, n6, pp. 11-13, Mar 75 EJ 116 576

Kits

At Home With Metric Measurement. Multimedia Kit. New York: Butterick, $75. Kit containing devices for measuring weight, temperature, capacity, and length; charts for metric pattern measurements; a cassette/filmstrip and a teachers manual.

Bielefield, Carole. SI-A Metric Workbook for Teachers of Consumer and Homemaking Education. Santa Ana, Ca.: Orange County Dept. of Education, 1974. $1.50. Transparency masters and classroom activities geared to daily measurement uses in the American home.

Measure and Observe Activiity Cards. Chicago, Ill.: Educational Teaching Aids, 1974. Set I, Length and Area, $3.95; Set II, Weight, $3.95; Set III, Liquid volume, $3.95. Set of 3, $11.50.
Forty-eight laminated cards which suggest activities for measuring with metric tools.

Measurement and Metric System Science Packet. Kit. Washington, D.C.: National Science Teachers Association, 1973. #3.00.
Multimedia kit includes centimeter rulers, booklets, graph paper, decimeter box, charts, conversion tables, and resource listings.

Measurement Skills. Multimedia kit. Encyclopaidia Britannica, 1972. $60.00. Lessons including booklets, task cards, and tools for measuring picture models.

Metric Length and Area. Multimedia kit. Chicago,Ill.: Weber Costello, 1974.$14.95. Cassette program including tape measures, area grids, height measures, spirit masters, posters, and teacher's manual.

The Metric Center. Kit. Palo Alto, Ca.: Enrich, 1974. $55
Instruments and other materials in a kit, with activities, questions, and a device for individual response and feedback.

NBS Metric Kit. U.S. Department of Commerce. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. $2
Metric converion card, ruler, brief history of measurement systems with chart of the modernized metric system, references on metric information, basic information.

Pamphlets

Barbrow, Louis E. What About Metric? National Bureau of Standards, Consumer Information Series 7. 1973. $1.10 (SD Catalog No. 0303-01191).
Colorful pamphlet of metric information with pictures. Useful for display.

Going Metric. Greenfield, Ma.: Channing L. Bete, 1974. 25¢
Pamphlet describes the Modernized Metric System (SL) and why it is coming to the United States.

An Introduction to Mathematical Concepts. Ohaus Scale Corporation, 1973, 15 pp. $1.
Utilizes cm cubes to teach 19 introductory concepts

Leffin, Walter W., Going Metric: Guidelines for the Mathematics Teacher, Grades K-8. 1975, 48 pp. $1.50. National Council of Teachers of Mathematics, 1906 Association Dr., Reston, VA 22091.
Background for learning and teaching metrics, includes classroom activities.

The Modernized Metric System...Explained. Neenah, Wis. J. J. Keller, 1974. 49¢.
A comprehensive leaflet of metric information with some history, an overview, and conversion factors.

Moving Toward Metric. New York: J.C. Penney, 1974. Free on request to Educational Relations Dept.
Packet of material on metric consumerism. Scripts for radio-TV included.

The Swing to Metric. Detroit: General Motors Corp, 1973. Request pamphlet from Personnel Communications Department.
Metric system background and growth, with applications to General Motors.

Teacher's Resource Guide for Metric Education, Michigan Department of Education, 1976, 46 pp.
how-to, teaching principles, sample activities, sources, equipment lists.

West, Tommie A. Teaching Metrics to Beginners, 1975, 7 pp.. National Education Assoc. 1201 16th St., N.W., Washington, D.C. 20036
Principles of teaching the system to elementary students.

Sources of Aids and Materials

NCTM Metrication Update and Guide to Suppliers of Metric Materials, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091.

Metric Aids: A Catalog of Materials for Metric Teaching Aids, 74 Horner Ave., Toronto, Canada.

Metric Training Aids (Price List). Metric Association Inc., Sugarloaf Star Route, Boulder, Colorado 80302.

Organizations Marketing Metric Materials for Educators. National Council of Teachers of Mathematics, 1201 16th Str., N.W. Washington, D.C. 20036.

The Metric System in the Home, 1973, 16 pp. Honeywell Inc.
recipes, kitchen measures, clothing sizes

Metricook: Recipes in Metric Measure for the Student Chef. 1974, 46 pp. $2.95. Metricraft, Inc., 1104 Lawrence, Los Angeles, CA 90021.

Metric Measurement Equipment

A listing of measurement equipment used in the training of metric leaders participating in the Maine Metric Education Leader Training Program and exhibited at workshop session #4:

Linear Measurement

___centimeter cubes

___diameter guage

___metrilogs

___meterstick, uncalibrated

___meterstick, calibrated

___metric adhesive tape

___metric height measurer

___micrometer-25 mm

___rulers

___tape, 10 m wind-up

___tape, 3 m

___tape, 1.5 m vinyl

___tape, uncalibrated

___trundle wheel

___vernier calipers

___bow calipers

___inside-outside calipers

Area

___ cm^2 graph paper

___ m^2 chart

___ transparent cm^2 grid

Volume

___ centimeter cubes

___cubic meter

___cup, 30 m

___flask, 250 m

___flask, 500 m

___glass beaker, 200, 400, 800 m

___graduated cylinder, 50, 100 m

___liter cube

___metric cups-50, 125,250 m

___metric spoons-1,2,5,15,25 m

___plastic liter pitcher

Mass

___balances:

___dial-o-gram

___liter pan

___pan

___primer

___platform

___bar mass set

___brass mass set

___centimeter cubes

___mass piece-kg

Mass

___masses, stacking plastic

___personal scale

___platform scale- 1 000 g

___spring scale-3 kg, 6 kg, 15 kg

Temperature

___temperature demonstrator

___thermometer, candy

___thermometer, clinical

___thermometer, laboratory

___thermometer, meat

___thermometer, outdoor

___thermometer, referenced, plastic backed

Force

____spring scale, newton

Pressure

___ tire pressure gauge

Refer to Sources of Metric Materials for names and addresses of suppliers of measurement equipment.

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
1906 Association Drive, Reston, Virginia 22091 / Telephone 620-9840, Area Code 703

Metric Concerns In Relating To Parents

The statements below are suggestions for teacher and administrator consideration as they relate to parents of children learning the "metric way."

1. It is better to provide several communications (programs, newsletters, etc.) than to attempt presentation of the metric system in a single effort.

2. Keep it simple! Parents need to know the basic notions about the metric system.

Commonly used units	Some referent conversions	Your own referents for estimation
cm, m, km, g, kg, ℓ	1ℓ is about 1 quart 1m is about 1 yard 1 km little more than ½ mile 1 kg is about 2 pounds	To help make estimation, learn the metric measures of your own: hand width, pace, height, weight, etc.

3. Keep things in perspective! Speed limit signs will not change from 55 m/h to 88.495 km/h. They will read 90 km/h.

4. What can be done for the community? Determine the nature of your community -- its business and industry. Find out what they have done regarding metric conversion. Develop programs related to these programs.

5. While the above is an individual matter, some suggestions for a Parent night follow.

   a. 10 minutes: General discussion of attempts to change our systems of measure since Jeffersonian times.

   b. 15 minutes: Film, such as "A Metric America," that gives a brief overview of metric system in a simple way.

   c. 20 minutes: Discussion-dialogue involving audience in some estimation activities, again emphasizing the simplicity when "thinking metric" rather than "converting."

   d. 20 minutes: Refreshments -- use metric recipes, pour metric amounts in cups (250 ml). Use "information bands" around the cups and place mats related to metric.

e. 30 minutes: Open-house in the classroom with students performing activities for parent observation.

6. A "metric fair" or activity day could be carried out where all the games, activities and food could be metric oriented. Advertise 15 cm hotdogs, ½ ℓ soda pop; print tickets in metric sizes; prepare games and stunts in metric such as a 3 m ring toss, 12 m cake walk, games where good estimates of metric measures win prizes.

7. Produce a bi-weekly or monthly newsletter.
    1. Current class activity, regarding metric
    2. Important ideas about metric
    3. Interesting metric facts
    4. An activity for the adults to work on

   An alternative is to have the newsletter be a part of the local newspaper.

8. Metric programs should be made known to the media (newspaper, radio, tv) and they should be encouraged to cover these activities. They should be encouraged to use metric units in their medium as a service to the community as the metric conversion takes place.

9. A key to community education is a series of programs/projects which focus on those notions the general public needs to know about the metric system. A simple straightforward approach is vital.

10. Go Metric in your community.

- The Metric Implementation Committee
(National Council of Teachers of
Mathematics) April, 1975

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- The Metric Implementation Committee
(National Council of Teachers of
Mathematics) April, 1975

Information for Parents

"All You Will Need to Know About Metric (For Your Everyday Life)," National Bureau of Standards information flyer. Order from Metric Information Office, National Bureau of Standards, Washington, D.C. 20 20234. Free.

"Metric Measure in a Nutshell," Brooklyn Metric Project, School of Education, Brooklyn College, Brooklyn, N.Y. 11210. Send self-addressed stamped envelope.

"A Parent's Guide to Homework," Winston-Salem/Forsyth County Schools, Instructional Development Center, 2720 S. Main St. , Winston-Salem, N.C. 27107

"A Parent's Guide to Metric Measurement," Minnesota State Department of Education, available from METS Program, P.O. Box 1113, Palo Alto, CA 94302.

"Parent Workshop Guide," Wayne-Westland Community Schools, Project Metric, 646 N. Wayne Road, Westland, Mich. 48185 . $2.00

"Think Metric," NEA and NCTM brochure, American Education Week, P.O. Box 327, Hyattsville, Maryland 20781. 30 for $2.25.

Sources of Metric Materials

1. Aakron Rule Corporation
59 Hoag Avenue
Akron, New York 14001

2. A. Balls & Company
P.O. Box 24200
Ft. Lauderdale, Florida 33307

3. Abbey Books
Metric Media Book Publishers
P.O. Box 226
Somers, New York 10589

4. Acme Ruler Company Limited
Foster Street, P.O. Box 239
Mount Forest, Ontario, Canada NOG 210

5. Acme United Corporation
100 Hicks Street
Bridgeport, Connecticut 06609

6. Activity Resources Company, Inc.
P.O. Box 4975
Hayward, California 94540

7. Addison-Wesley Publishing Co., Inc.
Sand Hill Road
Menlo Park, California 94025

8. Aero Educational Products Ltd.
P.O. Box 71
St. Charles, Illinois 60174

9. Aims Instructional Media Services, Inc.
P.O. Box 1010
Hollywood, California 90028

10. Allyn-Bacon, Inc.
470 Atlantic Avenue
Boston, Massachusetts 02210

11. American Association of School Librarians
50 East Huron Street
Chicago, Illinois 60611

12. American Book Company
450 West 33rd Street
New York, New York 10001

13. American Home Economics Association
2010 Massachusetts Avenue, N.W.
Washington, D.C 20036

14. American Institutes for Research
Metric Studies Center
P.O. Box 1113
Palo Alto, California 94302

15. American National Metric Council
1625 Massachusetts Avenue, N.W.
Washington, D.C. 20036

16. American National Standards Institute
1430 Broadway
New York, New York 10018

17. Paul S. Amidon & Associates, Inc.
4329 Nicollet Avenue, South
Minneapolis, Minnesota 55409

18. Baker & Taylor Company
6 Kirby Avenue
Somerville, New Jersey 08876

19. Barr Films
P.O. Box 7-C
Pasadena, California 91104

20. Behavioral Research Laboratories
P.O. Box 577
Palo Alto, California 94302

21. Bell & Howell
Audio Visual Products Division
7100 McCormick Road
Chicago, Illinois 60645

22. BFA Educational Media
2211 Michigan Avenue
Santa Monica, California 90404

23. BHU
23358 Hartland Street
Canoga Park, California 91307

24. Brooks/Cole Publishing Company
540 Abrego Street
Monterey, California 93940

25. Canadian Metric Association
P.O. Box 35
Fonthill, Ontario, Canada LOS 1E0

26. Canadian Standards Association
178 Rexdale Boulevard
Rexdale, Ontario, Canada M9W 1B3

27. Canadian Instrument Company
Division of Impox Instrument Corp.
900 Riverside Drive
New York, New York 10032

28. Channing L. Bete Company, Inc.
45 Federal Street
Greenfield, Massachusetts 01301

29. John Colburn Associates, Inc.
1215 Washington Avenue
Wilmett, Illinois 60091

30 The Cooper Group
P.O. Box 728
Apex, North Carolina 27606

31. Coronet Instructional Media
65 East South Water Street
Chicago, Illinois 60601

32. Creative Publications, Inc.
P.O. Box 10328
Palo Alto, California 94303

33. Creative Teaching Associates
P.O. Box 293
Fresno, California 93708

34. Thomas Y. Crowell Company
666 Fifth Avenue
New York, New York 10019

35. The C-Thru Ruler Company
6 Britton Drive
Bloomfield, Connecticut 06002

36. Cuisenaire Company of America
12 Church Street
New Rochelle, New York 10805

37. A.R. David & Company
P.O. Box 24424
San Jose, California 95154

38. Denoyer-Coppert Audio-Visuals
5235 N Ravenswood Avenue
Chicago, Illinois 60640

39. Dick Blick Company
P.O. Box 1267
Galesburg, Illinois 61401

40. Dixie/Marathon Products
Division of American Can Company
One American Lane
Greenwich, Connecticut 06830

41. Dominie Pty Ltd.
8 Cross Street
Brookvale, Australia 2100

42. Edmund Scientific Company
101 E. Gloucester Pike
Barrington, New Jersey 08007

43. EdMediaTec, Inc.
P.O. Box 230
Wilkes-Barre, Pennsylvania 18730

44. Educational Aids and Supplies of Tommorr
(E.A.S.T), Inc.
P.O. Box 13375, University Station
Gainesville, Florida 32604

45. Educational Metrics Corporation
207 Sunset Boulevard
Blacksburg, Virginia 24060

46. Educational Products, Inc.
1211 W. 22nd Street
Oak Brook, Illinois 60521

47. Educational Teaching Aids
159 W. Kinzie Street
Chicago, Illinois 60610

48. Educulture, Inc.
1220 Fifth Street
Santa Monica, California 90406

49. Encyclopedia Britananica Educational Cor
425 N. Michigan Avenue
Chicago, Illinois 60611

50. Enrich
3437 Almo Street
Palo Alto, California 94306

51. Eye Data House
146-01 Anchor Avenue
Jamaica, New York 11435

52. Federal Reserve Bank of Minneapolis
Minneapolis, Minnesota 55480

53. Math-Master
P.O. Box 1911
Big Spring, Texas 79720

54. General Learning Corporation
250 James Street
Morristown, New Jersey 07960

55. Ginn & Company
191 Spring Street
Lexington, Massachusetts 01273

56. Anton Glaser
1237 Whitney Road
Southhampton, Pennsylvania 18966

57. Graphic Calculator Company
234 James Street
Barrington, Illinois 60010

58. Great Ideas, Inc.
P.O. Box 274
Commack, New York 11725

59. Great Plains National Instructional
Television Library
Box 80669
Lincoln, Nebraska 68501

60. Harcourt Brace Jovanovich, Inc.
School Department
1372 Peachtree Street, NE
Atlanta, Georgia 30309

61. D.C. Heath and Company
125 Spring Street
Lexington, Massachusetts 02173

62. Houghton Mifflin Company
One Beacon Street
Boston, Massachusetts 02107

63. Idaho Research Foundation, Inc.
P.O. Box 3367, University Station
Moscow, Idaho 83843

64. Ideal School Supply Company
11000 South Lavergne Avenue
Oak Lawn, Illinois 60453

65. Imperial International Learning Corp.
P.O. Box 548
Kankakee, Illinois 60901

66. Industrial Press, Inc.
200 Madison Avenue
New York, New York 10016

67. The Instructor Publications, Inc.
Instructor Park
Dansville, New York 14437

68. International Tutors
22303 Devonshire Street
Chatsworth, California 91311

69. Janus Associates
P.O. Box 96
Wethersfield, Connecticut 06109

70. Jay Scott Associates
P.O. Box 4065
Memphis, Tennessee 38104

71. Jem Innovations
4568 East 45th Street
Tulsa, Oklahoma 74135

72. J.J. Keller & Associates, Inc.
145 W. Wisconsin Avenue
Neenah, Wisconsin 54956

73. Kelm Manufacturing Company
3151 U.S. 33 North
Benton Harbor, Michigan 49022

74. Kent Educational Services
P.O. Box 903
Oviedo, Florida 32765

75. Laidlaw Brothers
A Division of Doubleday
Thatcher and Madison
River Forest, Illinois 60305

76. The Lawhead Press, Inc.
900 East State Street
Athens, Ohio 45701

77. Leicestershire Learning Systems
Box 335
New Gloucester, Maine 04260

78. Library Filmstrip Center 3033 Aloma
Wichita, Kansas 67211

79. MacMillan of Canada/
MacLean Hunter Learning Materials
70 Bond Street
Toronto, Ontario, Canada M5B 1X3

80. The Math Group, Inc.
5625 Girard Avenue So.
Minneapolis, Minnesota 55419

81. Math Shop
5 Bridge Street
Watertown, Massachusetts 02172

82. McGraw-Hill, Inc.
1221 Avenue of the Americas
New York, New York 10020

83. Media Materials, Inc.
409 W. Cold Spring Lane
Baltimore, Maryland 21210

84. Charles E. Merrill Publishing Division
Bell & Howell Company
1300 Alum Creek Drive
Columbus, Ohio 43216

85. Metric-Aids Ltd.
75 Horner Avenue
Toronto, Ontario, Canada M8Z 4X7

86. Metric Association, Inc.
Sugarloaf Star Route
Boulder, Colorado 80302

87. Metric Consultants
21720 W. North Avenue
Brookfield, Wisconsin 53005

88. Metric Supply International
Metric SI/USA
1906 Main Street
Cedar Falls, Iowa 50613

89. Metric Teaching Aids
2858 Carolina Avenue
Redwood City, California 94061

90. Metrication Institute of America
P.O. Box 236
Northfield, Illinois 60093

91. Metrix Corporation
P.O. Box 19101
Orlando, Florida 32814

92. Midwest Publications Company, Inc.
P.O. Box 129
Troy, Michigan 48084

93. Milton Bradley Company
Springfield, Massachusetts 01101

94. Minneapolis Public Schools
Math Basic Skills Development Project
2908 Colfax Avenue South
Minneapolis, Minnesota 55407

95. Mind/Matter Corporation
P.O. Box 345
Danbury, Connecticut 06810

96. Mississippi Authority for Educational Television
P.O. Drawer 1101
Jackson, Mississippi 39205

97. Moyer Mico Ltd.
25 Milvan Drive
Weston, Ontario, Canada M9L 1Z1

98. Multi-Media Publishing, Inc.
1601 S. Federal Boulevard
Denver, Colorado 80219

99. National Bureau of Standards
Metric Information Office
Washington, D.C. 20234

100. National Council of Teachers of Mathematics
1906 Association Drive
Reston, Virginia 22091

101. National Education Association
1201 16th Street, N.W.
Washington, D.C. 20036

102. National Microfilm Association
8728 Colesville Road
Silver Spring, Maryland 20910

103. National Science Teachers Association
1742 Connecticut Avenue
Washington, D.C. 20009

104. National Textbook Company
8259 Niles Center Road
Skokie, Illinois 60076

105. National Tool, Die & Precision Machini
Association
9300 Livingston Road
Washington, D.C. 20022

106. NBC Educational Enterprises
30 Rockefeller Plaza
New York, New York 10020

107. Ohaus Scale Corporation
29 Hanover Road
Florham Park, New Jersey 07932

108. Orange County Department of Education
1250 South Grade Avenue
Santa Ana, California 92705

109. Oxford Films
1136 N. Las Palmas Avenue
Los Angeles, California 90038

110. Parks and Math Company
954 Idlewood Drive
San Jose, California 95121

111. Pathescope Educational Films, Inc.
71 Weyman Avenue
New Rochelle, New York 10802

112. Pauper Press
Box 303
Two Rivers, Wisconsin 54241

113. E. Joe Penn
4910 Carson Avenue
Indianapolis, Indiana 46227

114. Pickett Industries
17621 Von Karman Avenue
Irvine, California 92705

115. Polymetric Services, Inc. and AMJ
Publishing Company
18324 Oxnard Street
Tarzana, California 91356

116. Random House, Inc.
201 East 50 Street
New York, New York 10022

117. Rapidesign, Inc.
Box 6039
Burbank, California 91510

118. Real-T-Face
26 Overlook Drive
Warwick, New York 10990

119. Regal-Beloit Corporation
P.O. Box 38
South Beloit, Illinois 61080

120. Research Associates
P.O. Box 13237
Gainesville, Florida 32604

121. Roe International, Inc.
217 River Avenue
Patchogue, New York 11772

122. Ronningen Metric Company
6102 Palo Cristi
Paradise Valley, Arizona 85253

123. Rowsey Enterprises
P.O. Box 666
Friendswood, Texas 77546

124. Safco Manufacturing, Inc.
6500 Depot Drive, Box 7898
Waco, Texas 76710

125. Sales Aids, Inc.
201 Bear Hill Road, P.O. Box 552
Waltham, Massachusetts 02154

126. Howard W. Sams & Company, Inc.
4300 West 62nd Street
Indianapolis, Indiana 46268

127. Sargent-Welch Scientific Company
7300 North Linder Avenue
Skokie, Illinois 60076

128. Roy G. Scarfo, Ind.
P.O. Box 217
Thorndale, Pennsylvania 19372

129. Schloat Productions
150 White Plains Road
Tarrytown, New York 10591

130. Scholastic Magazines, Inc.
50 West 44th Street
New York, New York 10036

131. Science and Mathematics Teaching Center
College of Education Publications Office
Erickson Hall, Michigan State University
East Lansing, Michigan 48824

132. Scott, Foresman and Company
1900 E. Lake Avenue
Glenview, Illinois 60025

133. See Hear Now! Ltd.
49 Wellington Street, East
Toronto, Canada M5E 1C9

134. Robert C. Sellers & Associates, Inc.
131 Tulip Avenue
Floral Park, New York 11001

135. The Smallstate Company
Box 796
Warwick, Rhode Island 02888

136. Society for Visual Education, Inc.
1345 Diversey Parkway
Chicago, Illinois 60614

137. Spectrum Educational Supplies Ltd.
8 Denison Street
Markham, Ontario, Canada L3R 2P2

138. Stanley Toole
600 Myrtle Street
New Britian, Connecticut 06050

139. Sterling Plastics
Division Borden, Inc.
253 Sheffield Street
Mountainside, New Jersey 07092

140. Sterling Publishing Company, Inc.
419 Park Avenue South
New York, New York 10016

141. Summit International Corporation
180 West 2950 South
Salt Lake City, Utah 84115

142. Teach 'em, Inc.
625 N. Michigan
Chicago, Illinois 60611

143. Teachers
P.O. Box 398
Manhattan Beach, California 90266

144. Troubador Press
126 Folsom Street
San Francisco, California 94105

145. Union Carbide Corporation
Educational Aids Department
P.O. Box 363
Tuxedo, New York 10987

146. United States Air Force
Headquarters Air Training Command
Randolph Air Force Base, Texas 78148

147. Universal Education and Visual Arts
100 Universal City Plaza
Universal City, California 91608

148. Universal Supply Company
1561 N. Bonnie Beach Place
Los Angeles, California 90073

149. Viking Press
625 Madison Avenue
New York, New York 10022

150. Visual Instruction Productions
Victor Kayfetz Productions, Inc.
295 W. 4th Street (near Bank Street)
New York, New York 10014

151. Vogel Book Company
P.O. Box 103
Bellevue, Washington 98009

152. Weber Costello
1900 N. Narragansett Avenue
Chicago, Illinois 60639

153. West-East Bridge, Unlimited
P.O. Box 1402
Scottdale, Arizona 85251

154. Weybright and Tally
750 Third Avenue
New York, New York 10017

155. John Wiley and Sons, Inc.
605 Third Avenue
New York, New York 10016

156. Willowdale Media, Inc.
12 Parfield Drive
Willowdale, Ontario, Canada M2J 1B9

157. Willow House Publishers
111 N. San Joaquin Street
Stockton, California 95202

158. Worcester Public Schools
20 Irving Street
Worcester, Massachusetts 01609

APPENDIX 11/74

159. Davidson Films, Inc.
3701 Buchanan Street
San Francisco, California 94123

160. DCA Educational Products
424 Valley Road
Warrington, Pennsylvania 18976

161. Educational Activities, Inc.
1937 Grand Avenue
Baldwin, New York 11510

162. Incentive Publications, Inc.
Box 12522
Nashville, Tennessee 37212

163. Inquiry Audio Visuals
355 Lexington Avenue
New York, New York 10017

164. Jaydee Specialties
P.O. Box 536
Wilmette, Illinois 60091

165. Michigan Council of Teachers of Mathematics
2165 E. Maple Road
Birmingham, Michigan 48008

166. J.C. Penney Company, Inc.
1301 Avenue of the Americas
New York, New York 10019

167. Pergamon Press, Inc.
395 Saw Mill River Road
Elmsford, New York 10523

168. Phi Delta Kappa Educational
Foundation
Eighth and Union, Box 789
Bloomington, Indiana 47401

169. Bol-Ruler Company
1217 Dunham Road, Box 164
Riegelsville, Pennsylvania 18077

170. Society of Manufacturing Engineers
20501 Ford Road
Dearborn, Michigan 48128

171. TELEX Communications, Inc.
9600 Aldrich Avenue, South
Minneapolis, Minnesota 55420

172. Creative Teaching Press
514 Hermosa Vista Avenue
Monterey Park, California 91754

ELEMENTARY LEVEL METRIC MATERIALS

Books

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SECONDARY LEVEL METRIC MATERIALS

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Periodicals

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Games

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Duplicating Masters

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APPENDIX B - RESOURCES

A. Selected Bibliography
    1. Books and Bulletins
    2. Audio-Visual Aids
    3. Metric Resources and Periodicals

B. Sources of Metric Equipment and Supplies
    1. Manufacturers
        a. Bearing, Gears, Pulleys
        b. Conversion Devices — Dual Reading Dials
        c. Cooking Equipment — Spoons, Cups Etc
        d. Cutting Tools — Drills, Reamers, Taps, Dies, Milling Cutters
        e. Digital Readout Equipment
        f. Drafting Supplies and Materials
        g. Fasteners
        h. Hand Tools — Rules, Wrenches, Small Tools
        i. Machine Tools
        j. Precision Tools and Gages
        k. Testing, Measuring Machines and Equipment
        m. Thermometers
        n. Weighing Scales
    2. Industrial Distributors
    3. School Distributors

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• J. J. Keller and Associates, Inc., 145 West Wisconsin Avenue, Neenah, WI 54956. METRIC SYSTEM GUIDE BULLETIN.

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• U.S. Metric Association, Inc., c/o Louis Sokol, Sugarloaf Star Route, Boulder, CO 80302. U.S. METRIC ASSOCIATION NEWSLETTER.

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(1) ________	________	________ ________ ________
(2) ________	________	________ ________ ________
(3) ________	________	________ ________ ________
(4) ________	________	________ ________ ________
(5) ________	________	________ ________ ________

III. Find and list 5 teaching aids that you like:

Teaching Aid	Where to obtain
(1) ____________	____________ ____________ ____________
(2) ____________	____________ ____________ ____________
(3) ____________	____________ ____________ ____________
(4) ____________	____________ ____________ ____________
(5) ____________	____________ ____________ ____________

IV. Discuss the various ways you could use these items (II and III) in your training sessions.

MAINE METRIC EDUCATION LEADER TRAINING PROGRAM

METRIC EDUCATION PLANNING GUIDE

You have already done some preliminary planning for the kind of basic metric education which you could offer in your community. In order to finalize your plans, you should complete the planning activities which are outlined in this Guide. The style of metric education which you can offer as a metric leader will depend upon you and the people you know and work with. This Guide will help you to plan whatever educational experience you would like to lead whether it is a metric sewing class in your home, an on-the-job training program for your business, an in-service workshop for teachers, or another educational idea which you have.

The Guide describes eight steps which can be followed in planning for successful metric education. Where appropriate, examples are used to show you how each step can be carried out. If you are able to complete each step we believe that you will have given people a positive introduction to the metric system.

Separate PLANNING BOOKLETS are provided for you to keep a record of your plans. Please make two copies and bring them with you to the final meeting of the Maine Metric Education Leader Training Program. We do not expect that your plans will necessarily be complete but that you will be well on your way to planning a metric education experience for people in your community.

READ THE ENTIRE GUIDE BEFORE YOU DO ANYTHING.

John W. Butzow
Bernard R. Yvon
Gregory Marshall
University of Maine at Orono

I. IDENTIFY

IDENTIFY the group of people to whom you could offer a positive metric education experience.

Consider the following factors in making your selection of a group or individuals to work with:

A. Your familiarity with the group and individuals in the group.

Do you feel comfortable working with the people who are in this group?

Do you have contact persons in the group who can help you arrange for metric education to take place.

B. Your knowledge of the measurement needs of the group and individuals in the group.

Do you know what the group needs to know about measurement?

Do you have the resources to help you teach members of the group how to make basic metric measurements?

Can you realistically teach the members of the group how to benefit by using the metric system?

C. Your resources?

How much time will be required to plan and carry out your metric education plan?

How many people can you comfortably work with given the ideas and resources which you have?

Examples of the kinds of groups you might consider working with might include:

- PTA
- neighbors
- trade unions
- Boy Scouts
- business associations
- retired persons
- Lions Club
- fellow employees
- church groups
- 4H

Since everyone makes some kind of measurements in their daily life, the types of people to whom you could give a basic introduction or more advance instruction in metrics are many and varied.

II. SET GOALS

Having identified a group of people to whom you could offer a positive metric education experience, you should determine what aspects of the metric system they need to know and which aspects you can teach them. SET GOALS for your metric education.

Goals should take into account what people need to know. They should reflect what people need to know how to measure and how much they already know about metrics.

Goals should be well-defined and should state precisely what you intend to teach the people how to do. "To teach them the metric system" is not a well-defined goal. "To teach nurses how to estimate the weight of new-borns and measure the weight of new-borns in kg" is a well-defined goal.

Goals should reflect the amount of time you have and the resources you have to reach them. Limited goals which are achieved are preferable to many goals which are only touched upon.

Some examples of well-defined goals might include:

	Group	Goal
Example 1	woodsmen	To teach woodsmen how to estimate and measure forestland in hectares.
Example 2	homemakers	To teach homemakers how to measure cloth in the process of sewing with a metric pattern.
Example 3	parents of school-age children	To teach parents the common measurement activities in which second grade children are involved.

Appropriate, well-defined goals will help you to plan and carry out the remaining steps in this Guide.

III. OUTLINE AND SCHEDULE

OUTLINE the steps that you will take to reach your goals.

Your outline should be a detailed description of your metric education program including the activities you develop to help you and the people you are working with to reach the goals which have been set.

An outline which might be used to reach the goal set for Example 1 above might look like this:

I. **Meter**

A. Use unmarked metersticks to find objects which are approximately 1 meter long. (20 min.) 9:00 a.m.

B. Use a calibrated meterstick to measure specific distances to the nearest meter. (20 min.) 9:20 a.m.

II. **Area**

A. Show how meters can be used to measure surface area in m^2. (15 min.) 9:40 a.m.

B. Measure various areas indoors and outdoors in m^2. (30 min.) 9:55 a.m.

III. **Ares and Hectares**

A. Measure one are which is 10 m x 10 m = 100 m^2. (10 min.) 10:25 a.m.

B. A hectare is 100 m x 100 m = 10 000 m^2 or 100 are. (5 min.) 10:35 a.m.

C. Determine the length of pace and pace off 1 ha of forestland. (40 min.) 10:40 a.m.

D. Use a topographic map to estimate and measure land area. (30 min.) 11:20 a.m.

E. Measure the area of a land sector in ha units in the field. (40 min.) 11:50 a.m.

Total 210 min. END 12:30 p.m.

Once you have outlined what you plan to do during the training you will offer, estimate the amount of time required to complete each of your activities and create a time line as shown in the example above.

Remember it is best to have limited goals which can be reached in the time which is available to you. For example you may be able to complete only I and II in the example given, if you only have a short time period and you may have to schedule another meeting.

IV. MATERIALIZE

Use the outline you have developed to determine what kind of materials you will need for your program. The measurement equipment, printed material, and other resources you will need can begin to MATERIALIZE once you have determined what you need.

For example to complete the activities described in the outline for our woodsmen education, we would need:

I. A. metersticks unmarked
I. B. calibrated metersticks, marked distances

II. A. an instruction sheet entitled "How to Measure Area"
II. B. metersticks, 50 m tapes

III. A. 50 m tapes
III. B. "How to Measure Land Area"
III. C. 50 m tape
III. D. topographic maps, rulers
III. E. topographic maps of area to be measured

Once you have developed a list of materials from your outline, you can make a complete equipment list indicating the total amount of equipment you will need.

Measurement Equipment	Printed Material	Other Resources
10 metersticks unmarked	"How to Measure Area"--10 copies	10 topographic maps
10 metersticks calibrated		
50 m tape-5		
10 rules-30 cm		

Begin to materialize by collecting the equipment you need. Remember there are many ways to obtain the things you need:

A. Borrow equipment from a school or industry.

B. Make your own equipment, if possible.

C. Ask the participants to contribute toward buying the equipment which they can then keep and use.

D. Influence the leaders of the group you will be working with to make an investment in equipment.

E. Find a local source willing to donate money for resources (example: Jaycees, Kiwanis, etc.).

A list of sources for metric education materials will be available to you. Use this list to write for catalogs and price lists. Most equipment you should be able to find locally, if you are willing to "scrounge".

V. CONTACT

CONTACT people in the group you would like to work with and in particular the leaders of the group.

Describe to them the kind of metric experience you would like to offer.

Enlist the help of people in the group in completing or modifying steps I through IV. IT MAY BE HELPFUL TO TALK WITH PEOPLE IN THE GROUP BEFORE YOU BEGIN PLANNING AND INVOLVE ONE OR MORE PEOPLE FROM THE BEGINNING OF THE PLANNING PROCESS.

Obtain a commitment from people in the group to help you with:

Publicity

Recruiting participants

Gathering Equipment

Finding a time and place for the event

The greater the investment on the part of the people you are working with the greater the level of their participation.

VI. PLACE AND TIME

Select a place where you can offer your training.

The place should comfortably accommodate the number of people you expect to participate.

The place should be adaptable for the kinds of activities in which people will be engaged.

The kinds of places which you might consider include schools, churches, industrial facilities, homes, lodges, and fraternal organizations, town halls, etc.

Select a time for the event.

The time should be appropriate for the people to attend.

Allow sufficient time to complete the program you have outlined.

Confirm both the time and place with the person who is responsible for the use of the facility.

VII. PUBLICIZE

Do everything you can to get the word out about your event in order to interest people in the opportunity which you are offering.

Select the best way to reach the people you are intending to train:

Telephone
Television
Radio
Newspapers
Newsletters
Personal Invitations
Letters
Posters

The more personal you can make your publicity the more successful it will be.

In all of your publicity, clearly state what you will be doing, for whom, when and where.

Make a list of the people who are committed to being there.

VIII. EVALUATE

You will want to know how effective your training has been. Did people learn something and do they have a positive attitude toward what they did?

Your evaluation may be structured and include some form of test to determine how much people learned. In Example I above you might ask each participant to measure a sector of land whose area you have already determined. If their answer is reasonably close to the accepted value then they have reached their goal. A more highly structured approach to evaluation might include a pre-test to find out how much people know prior to your metric education followed by a post-test when the program is completed.

Your evaluation may be less structured and simply include your observation of the outcomes of your training. In Example 2 above you might check back with the people in your metric sewing group to see the results of their handiwork and ask them how they enjoyed sewing metrically.

Include the kind of evaluation which is most appropriate for you and the type of metric education you are offering.

NOW THAT YOU HAVE READ THIS GUIDE YOU CAN BEGIN PLANNING USING THE PLANNING BOOKLET. WE WILL BE GLAD TO HELP YOU IN WHATEVER WAY WE CAN. WRITE TO US:
206 Shibles Hall
University of Maine at Orono
Orono, ME 04473

or call: 581-2754

Maine Metric Education Leader Training Program

METRIC EDUCATION PLANNING BOOKLET

IDENTIFY

The group to whom you plan to offer metric education.

The factors you considered in selecting this group.

The number of people whom you expect to be involved in training.

SET GOALS

What do the people you are working with use measurement for?

What are your goals for a metric education experience?

OUTLINE AND SCHEDULE

Outline and schedule at least one metric education experience.

How much time is required?

When do you plan to begin and end this education experience?

Date:

Time:

MATERIALIZE

List the amount of equipment you will need.

measurement equipment	printed material	other resources

CONTACT

Whom did you contact to obtain advice and assistance in setting up your training program?

What kinds of assistance will you receive?

PLACE AND TIME

Where will you hold your metric education event?

What are the aspects of this place which make it an attractive place for metric education?

What are the negative aspects of the place which may detract from the education you are offering?

PUBLICIZE

What kinds of publicity will you use to interest people in your training event?

What is the message you are communicating in your publicity?

What are the names of the people who will attend?

EVALUATE

How do you plan to determine what people have learned?

How do you plan to determine how people feel about the learning experiences?

Name:____________________________
Soc. Sec. #______________
Pre____ Post____

EVALUATION OF THE TRAINING SESSION

Directions: Please take a few minutes to respond to the four items below. Your response will help us to evaluate this training session and to identify ways to improve future training sessions.

1. What is your over-all impression concerning the effectiveness of this training session?

Very Effective	Effective	Ineffective	Very Ineffective

2. Please identify one or more strength(s) of this training session.

3. Please identify one or more weakness(es) of this training session.

4. Please identify one or more way(s) you feel we could improve future training sessions.

Metric Education Report

Name________________________ Address________________________

____

1. Please describe the location where the training session was held. (i.e., home, local school, club, civic group meeting room, etc.)

____

____

2. Date of Session________________________

3. How long was the training session? (Time in Minutes)____________

4. Number of participants present________________________

5. Please describe the way in which you recruited the participants for the training session.________________________

____

____

6. What is the primary occupation of the participants? (e.g., teacher, housewife, engineer, clerk, etc.). Please identify these occupations and the number of each.

Occupation:	Number:

7. Please write a brief description of the training session. (i.e., what did you do?)________________________

____

____

8. What metric measures did you work with in the training session?________

____

9. Please list any equipment and materials you used in the training session.

______________ ______________ ______________

______________ ______________ ______________

______________ ______________ ______________

*Note: Please attach to this form a copy of any printed material you used in the training session.

10. I believe I was adequately trained in the metric workshop to conduct this training session. (Check one)

_____strongly agree

_____agree

_____disagree

_____strongly disagree

11. What one activity or experience in the metric workshop do you believe was most helpful in preparing you to conduct the training session?

____

____

12. What one activity or experience in the metric workshop do you believe was least helpful in preparing you to conduct the off-site training session?

____

____

13. What changes would you suggest in future metric workshops to more adequately prepare others to conduct training sessions?______________

____

____

14. I believe I was effective in teaching the participants at this training session about metrics. (Check one)

_____strongly agree

_____agree

_____disagree

_____strongly disagree

15. If you were to run another training session what would you do to change it?____

____

____

16. Did the participants in the training session make any comments about the content or effectiveness of the session? If so, what were their comments?____

____

____

17. What, if any, are your plans for conducting additional training sessions?____

____

____

18. Please comment briefly on anything not covered in this summary.________

____

____

19. Where did you participate in the Maine Metric Education Leader Training Program

Van Buren_____

Presque Isle_____

Millinocket______

Bangor______

Waterville_____

Auburn_____

South Portland____

20. Send this report to Dr. David Silvernail
Bailey Hall
University of Maine at Portland-Gorham
Gorham, ME 04038

Please mail report by May 17, 1978

Attendance
Metric Needs

Session: #1 #2 #3 #4 #5 (circle)

Site: Bangor Van Buren Waterville S.Portland

Millinocket Presque Isle Auburn (circle)

Name:________________________________

Address:______________________________

____

Telephone:____________

I have the following needs related to the metric measurement system:

(1)

(2)

(3)

(4)

(5)

Occupation:____________________________

Metric Olympics

Directions:

1. Select a team name and appoint a captain.
2. Complete each of the following events using only the contestants that you have designated on your entry form. No substitutes allowed.
3. Event #1 will be run first. Complete the remaining events in the order decided upon by your team.
4. Use the score sheet to record your score but also be certain to report to the scorers table after every four events.
5. Do not share information about your results for any of the events with other teams since this will affect the outcome of the competition.
6. Points will be awarded for each event. First Place= 5 pts; Second Place= 3 pts; Third Place= 2 pts; Fourth Place= 1 pt.

Event #1 Total Mass

A. Estimate the weight of the people assembled by the Olympic directors at the front of the room.

B. One guess at the total mass per team. Report your estimate to the scorers table.

Event #2 Standing Broad Jump

A. Three team members jump from a standing position.

B. Measure the distance of each jump in meters. Measure distance to point where heel first touches ground.

C. Report the total distance of the combined jumps in cm to the scorer's table.

Event #3 Big Foot

A. Line up the four people entered in this event in a line with their left feet touching toe to heel.

B. Measure the total length of the four feet in cm.

C. Report this distance to the scorer's table.

Event #4 Squash of Strength

A. Place a ball of clay on a paper grid.

B. Using only your hand or fist, squash the clay with one direct blow. Pressing the clay is not permitted.

C. Measure the area covered by the squashed clay in cm^2. Count only those squares which are more than half covered.

D. Report the total area covered by the four people entered in this event.

Event #5 Eyedropper Trick

A. The four people entered in this event should transfer as much water as possible from pitcher #1 to pitcher #2 in 1 minute using only the eyedroppers to carry the water. Pitchers must be 2 m apart.

B. Record the total volume transferred in one minute in ml and report your total to the scorer's table.

Event #6 Volume of the Box

A. Estimate the number of centimeter cubes which could be placed in the box. Measurement of the box is not permitted and you are not permitted to be less than 2 m from the box when you estimate.

B. Report one estimate for your team to the scorer's table.

Event #7 Paper Discus

A. The two people entered in this event should throw one paper plate as far as possible from a starting point. First one person should hurl the plate and the second person should then throw from the point where the plate lands.

B. Measure the total distance in a straight line from the starting point to the plate's final resting place.

C. Report this distance in m to the scorer's table.

Event #8 Straw Javelin

A. Each team member should throw a straw and measure the perpendicular distance from the throwing line to the closest point on the straw.

B. Report the total distance for the team in m to the scorer's table.

Event #9 Cotton Ball Shot Put

A. Each of four team members entered in this event should put the cotton shot as far as possible.

B. Measure the perpendicular distance from the line to the point where the cotton shot lands.

C. Report the total distance of the four throws in m to the scorer's table.

Event #10 Cork Grab

A. The four team members selected for the event are permitted to take one handful of cork from the box.

B. Measure the total mass of corks in kg and report to the scorer's table.

Event #11 Sponge Squeeze

A. Each of four team members should soak the sponge and then squeeze as much water as possible into the liter pitcher. Use only one hand to squeeze the sponge.

B. Report the total volume of water for the four squeezes.

Event #12 Mass Guess

(guess)

A. Each member should the mass of the bag and its contents. Record these estimates.

B. Use a balance to find the mass of the bag and the contents

C. Find the difference between each estimate and the measured mass and express this difference as a positive number.

D. Report the total of the differences to the scorer's table.

Event #13 Temperature Guess.

A. Each member should estimate the temperature of the water in the container.

B. After these estimations are recorded, measure the temperature with a thermometer.

C. Find the difference between each of the estimates and the measured temperature to the nearest whole degree. Record as a positive number only.

D. Find the total of these differences found in part C and report this total to the scorer's table.

Event #14 Area Estimate

A. Each Team member should estimate the area designated for this event in cm^2. Record each of the estimates.

B. Measure the area in cm^2.

C. Find the difference between each of the estimates and the measured area. Record as a positive number only.

D. Find the total of these differences found in Part C and report this total to the scorer's table.

Event #15 Boltspiele

A. Each of the four people entered in this event should reach into the bag of bolts and without looking in the bag estimate by feel the diameter of the bolt in mm. Then remove the bolt from the bag and measure its diameter with a micrometer to the nearest whole mm. Find the difference between each estimate and each measurement.

B. Report the total of these differences to the scorer's table.

Event #16 Penny Toss

A. Each member of the team should toss a penny at the wall in the designated area. The object is to toss the penny as close as possible to the wall and the line on the floor.

B. Measure the distance of each toss as follows: (1) Measure the perpendicular distance of the penny from the wall in cm, (2) measure the perpendicular distance of the penny from the line in cm. Add (1) and (2).

C. Report the total distance from Part B. for your team to the scorer's table.

Event #17 Paper Airplane

A. Each member of the team should construct a paper airplane.

B. Launch the planes one by one from a starting point. The second plane should be launched from where the first lands; the third plane from where the second lands, etc.

C. Measure the straight-line distance from the starting point to the tail of the last plane in m.

D. Report to the scorer's table.

Event #18. Tiddly Winks

A. Tiddle the wink from a starting point. Each team member is allowed one flip from the point where the wink lands.

B. Measure the total distance from the starting point to where the wink finally comes to rest in m.

C. Report the distance to the scorer's table.

Event #19 Linear Estimation

A. Each member of the team should estimate the distance from A to B in m. Record the estimates.

B. Measure the distance from A to B to the nearest m and find the difference between each estimate and the measured value as a positive number.

C. Add the total of these differences and report the total to the scorer's table.

Event #20 Volume Estimation

A. Each team member should estimate the volume of the container.

B. Measure the volume to the nearest ml and express the difference between each estimate and the measured value as a positive number.

C. Report the total of these differences to the scorer's table

Record Sheet

Team:____________________________

Event #1 Estimate of total weight= ____________kg

Event #2 Jump 1=__________m

Jump 2=__________m

Jump 3=__________m

Total= __________m Total= ____________m

Event #3 Total length of four feet= ____________cm

Event #4 Squash Area 1=__________cm^2

Squash Area 2=__________cm^2

Squash Area 3=__________cm^2

Squash Area 4=__________cm^2

Total= __________cm^2 Total= ____________cm^2

Event #5 Total volume of water transferred= ____________m

Event #6 Estimate of # of cm cubes= ____________cm cubes

Event #7 Total distance= ____________m

Event #8 Throw 1=__________cm

Throw 2=__________cm

Throw 3=__________cm

Throw 4=__________cm

Throw 5=__________cm

Total= __________cm Total ____________cm

Event #9 Put 1=________m

Put 2=________m

Put 3=________m

Put 4=________m

Total= ________m Total= ___________m

Event #10 Total Mass of Corks ___________kg

Event #11 Squeeze 1=_________m

Squeeze 2=_________m

Squeeze 3=_________m

Squeeze 4=_________m

Total _________m Total= ___________m

Event #12 Estimate 1=________g - measured mass=__________g +_________g

Estimate 2=________g - measured mass=__________g +_________g

Estimate 3=________g - measured mass=__________g +_________g

Estimate 4=________g - measured mass=__________g +_________g

Estimate 5=________g - measured mass=__________g +_________g

Total Difference= _________g

Event #13 Estimate 1=________C° - measured temperature=______C° +_____C°

Estimate 2=________C° - measured temperature=______C° +_____C°

Estimate 3=________C° - measured temperature=______C° +_____C°

Estimate 4=________C° - measured temperature=______C° +_____C°

Estimate 5=________C° - measured temperature=______C° +_____C°

Total Difference= _________C°

Event #14 Estimate 1=______cm^2 - measured area=______cm^2 +______cm^2

Estimate 2=______cm^2 - measured area=______cm^2 +______cm^2

Estimate 3=______cm^2 - measured area=______cm^2 +______cm^2

Estimate 4=______cm^2 - measured area=______cm^2 +______cm^2

Estimate 5=______cm^2 - measured area=______cm^2 +______cm^2

Total Difference= ______cm^2

Event #15 Estimate 1=______mm - measured diameter=______mm +______mm

Estimate 2=______mm - measured diameter=______mm +______mm

Estimate 3=______mm - measured diameter=______mm +______mm

Estimate 4=______mm - measured diameter=______mm +______mm

Total Difference: ______mm

Event #16 Toss 1 Distance to wall=______cm
Distance to line=______cm
Total= ______cm

Toss 2 Distance to wall=______cm
Distance to line=______cm
Total= ______cm

Toss 3 Distance to wall=______cm
Distance to line=______cm
Total= ______cm

Toss 4 Distance to wall=______cm
Distance to line=______cm
Total= ______cm

Toss 5 Distance to wall=______cm
Distance to line=______cm
Total= ______cm

Total of Five Tosses= ______cm

Event #17 Total Distance= __________m

Event #18 Total Distance= __________m

Event #19 Estimate 1=______m - Measured Distance=______m +______m

Estimate 2=______m - Measured Distance=______m +______m

Estimate 3=______m - Measured Distance=______m +______m

Estimate 4=______m - Measured Distance=______m +______m

Estimate 5=______m - Measured Distance=______m +______m

Total Difference= +______m

Event #20 Estimate 1=_____mℓ - Measured Volume=________mℓ +______mℓ

Estimate 2=_____mℓ - Measured Volume=________mℓ +______mℓ

Estimate 3=_____mℓ - Measured Volume=________mℓ +______mℓ

Estimate 4=_____mℓ - Measured Volume=________mℓ +______mℓ

Estimate 5=_____mℓ - Measured Volume=________mℓ +______mℓ

Total Difference: +______mℓ

Natural Food Candy

Ingredients:	Amount:
peanut butter	120 g
carob powder	100 m
wheat germ	100 m
soy flour	150 m
vegetable oil	50 m
honey	50 m
raisins	50 m

1. Mix all ingredients together.
2. Take a pinch of mixture and roll into balls.
3. Eat.

5 servings

O.J. Surprise

Ingredients:	Amount:
orange juice	50 m
peanut butter	100 g
raisins	50 m
bread	5 slices

1. Measure all ingredients except bread into a small bowl.
2. Mix well.
3. Spread on a slice of bread.

5 servings.

Peanuts 'n Chips

Ingredients:	Amount:
powdered sugar	20 g
chocolate chips	40 g
sweetened condensed milk	80 g
peanut butter	120 g

1. Measure all ingredients into a small bowl.
2. Mix well.
3. Take a pinch of mixture and roll into a small ball.
4. Eat and enjoy.

5 servings

Snappy Cookies

Ingredients:	Amount:
crushed ginger snaps	480 m
chopped walnuts	180 m
orange juice	60 m
orange rind	30 m
honey	30 m
orange extract	5 m
wheat germ	120 m

1. Crush ginger snaps with rolling pin.
2. Measure all ingredients except wheat germ into bowl.
3. Mix well.
4. Measure wheat germ onto wax paper.
5. Take a pinch of mixture and roll into a ball.
6. Roll the ball into the wheat germ.
7. Eat and enjoy.

5 servings.

Metric Recipes

Lilting Liter Punch

Ingredients:	Amount:
cranberry juice	200 m
orange juice	200 m
strong tea	200 m
lemon juice	80 m
sugar	40 m
cloves	2
ginger ale	800 m

Mix in a large bowl and serve over ice.
6 servings.

Orange Shake

Ingredients:	Amount:
orange juice	450 m
instant powdered milk	150 m
vanilla	few drops

1. Measure ingredients into container with lid.
2. Shake vigorously.

5 servings.

Banana Milk Shake

Ingredients:	Amount:
ripe bananas	4
chilled milk	500 m
sugar	15 m
vanilla	few drops

1. Peel, then slice bananas into bowl.
2. Mash bananas with a fork.
3. Beat with egg beater and slowly add milk, sugar. and vanilla.
4. Beat well.

5 servings.

Crunchy Candy

Ingredients:	Amount:
sunflower seeds	50 m
cocoa	50 m
peanut butter	60 g
honey	50 m
sesame seeds	50 m

1. Measure first four ingredients into a bowl.
2. Mix well.
3. Measure sesame seeds on wax paper.
4. Take a pinch of mixture and roll into a ball.
5. Roll ball in sesame seeds.

5 servings

Name ______________________________

Social Security Number _______________

Metric Quiz for Session #5

Note: Questions #1 - #4 refer to the mildshake container distributed by the workshop leaders.

1. The distance across the top of the milkshake container is about __________ centimeters (cm).

2. The temperature of the water in the milkshake container is about __________ degrees celsius (c°).

3. How much does the milkshake container together with the water in it weigh? __________grams (g).

4. How much water does the milkshake container hold in milliliters? __________ milliliters (m)

5. The temperature in this room is about ________ degrees celsius (C°).

6. The height of the person selected by the workshop leaders is about __________ centimeters (cm).

7. The height of the tent pole is about __________ meters (m).

8. Make two marks on the line below showing a distance of 155 millimeters (mm).

9. How many liters of water could be poured into the pail being held by one of the workshop leasers before it will overflow __________ liters ( ).

10. The weight of the person selected by the workshop leaders is about __________ kilograms (kg).

Name:______________________________
Soc. Sec. #________________
Pre_____ Post____

OPINIONNAIRE ABOUT METRICS

Directions: Below are ten questions that deal with the metric system. Each item is followed by a line that represents a range of opinions you might hold. Please decide how you feel about each item and place an (X) at the point on the line that most closely reflects your opinion.

1. How well do you understand the metric system of weights and measures?

____

A Great Deal of Understanding	No Understanding

2. How much do you use metrics in your personal and/or professional life?

____

Use Metrics All the Time	Never Use Metrics

3. How comfortable do you feel with information reported in metric units?

____

Extremely Comfortable	Extremely Uneasy

4. How important do you believe it is for everyone to learn the metric system of weights and measures?

____

Extremely Important	Extremely Unimportant

5. How confident do you feel that you can help other people learn the metric system?

____

Very Confident	No Confidence

(Continue on opposite side)

6. What responsibility do you believe you have to help other people learn the metric system?

____

A Great Deal of Responsibility	No Responsibility

7. How important do you believe it is for all Americans to accept and use the metric system of weights and measures?

____

Extremely Important	Extremely Unimportant

8. How soon do you believe the United States' government should convert to the metric system?

____

Immediately	Never

9. How important do you believe it is for the United States' government to set an exact date for the conversion to the metric system?

____

Extremely Important	Extremely Unimportant

10. How soon do you believe businesses and industries should convert to the metric system?

____

Immediately	Never

Name: ______________________

Soc. Sec. # ____________

Pre____ Post____

EVALUATION OF THE TRAINING SESSION

Directions: Please take a few minutes to respond to the four items below. Your response will help us to evaluate this training session and to identify ways to improve future training sessions.

1. What is your over-all impression concerning the effectiveness of this training session?

Very Effective	Effective	Ineffective	Very Ineffective

2. Please identify one or more strength(s) of this training session.

3. Please identify one or more weakness(es) of this training session.

4. Please identify one or more way(s) you feel we could improve future training sessions.